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HAD the leaders of the Amalgamated Association ascertained the actual position of the iron trade, our belief is that the strike would not have taken place. It is understood that the general impression prevailing among the members is that it is inopportune, more particularly among those who will not be benefitted by its success, such as the finished iron workers and engineers. Hurriedly and inconsiderately got up, it is no wonder that misgivings should abound. At Pittsburgh the market price for iron is $5 a ton less than the card, on which basis the men were being paid. The strikes in Pittsburgh and Western districts should they continue cannot fail to strengthen prices. Mr. O. W. Potter, the President of the North Chicago Rolling Mill Company, has pointedly remarked: "It is not a strike against reduction. The employers are satisfied to pay the prices of 1881, notwithstanding the reduced prices for iron, and they cannot see any justice in this increased demand. The time has come when with the workers and employers alike there must be greater economy in their homes and in their manufacturing establishments or they cannot do business."

THE strike of the unionists employed at the Cleveland Rolling Mills may be confidently announced a certain failure. The partial but violent demonstrations made against the non-union workers have resulted in stronger civic measures of support to the latter, which will be sustained, if it shall be necessary, by the military forces of the county and State. Defiance of law is certainly not in the interests of labor. The sooner the Amalgamated Association announces itself defeated at Newburgh, the better for the thousands of industrious men its executive has so grossly misled. It is at every disadvantage at Newburgh. We learn that Mr. Jarrett on his visit to St. Louis has encountered only reproaches for not taking into account before directing the iron workers to strike, the alternative conditions now suggested, and referred to in another article.

IN consequence of the strike, the price of finished iron is advancing. The great reliance of the strikers for success is the indisposition of western manufacturers to give those of the East the advantage that results from inaction, and that the price of iron will so improve under the influence of the shut-down, as to allow of an advance being readily conceded. There is no assurance, however, in the event of the men returning to work, of an advance that has been made under exceptional circumstances being maintained. The action of Mr. Jarrett in advising Cincinnati strikers to resume work, as well as those of St. Louis providing these, before the strike, were under the Cincinnati schedule, shows a conviction on the part of the executive of the Amalgamated Association that the strike was inaugurated on too large a scale, and that the old policy of concentrating the action of that powerful body is the most effectual for its purposes. Appended is the agreement under which the Cincinnati iron workers have resumed:

AGREEMENT.

CINCINNATI, October 29, 1881.

The following is the agreement entered into this day between the proprietors of rolling mills in Cincinnati and vicinity and the workmen in conference for that purpose: We, the proprietors of the rolling mills in Cincinnati and vicinity, agree to pay the prices ruling here immediately prior to June first (1st), 1881, for skilled labor, until June 1st, 1882, anh from then after the prices shall be the same as may be adopted in Pittsburgh, Pa. In event of no price being fixed as the Pittsburgh and vicinity scale of wages on June first (1st), 1882, the men here are to continue work at the scales in force here prior to Jue 1st, 1881, and when a scale of wages be agreed upon at Pittsburgh, said scale of wages shall be the wage scale for Cincinnati and vicinity. It is agreed that where scrap and cinder fix is used in boiling, fifty (50) cents per ton be paid for boiling in addition to the price established for boiling where cold or patent ore fix is used. It is also agreed that the proprietors, in consideration of the workmen having accepted the Pittsburgh scale of wages as above specified, will furnish all the labor as furnished by Pittsburgh proprietors to men working at rolls, furnaces or other skilled work.

Here follow the signatures of the Conference Committees of manufacturers and workmen.

RAILWAYS are one thing to investors, another to the general public, and if there is any fact on which the world is agreed it is that whether or not they can afford a dividend to shareholders and furnish interest to bondholders, they are of clear advantage to the sections of country through which they run, increasing trade, adding value to land, and benefitting, directly or indirectly, the nation at large. We find, however, the New York *Tribune* taking a most lugubrious view of what may be termed the public results of new railway extensions. After pointing to the 3,480 miles of railroad which were opened for traffic between January and June of this year, it observes:

"New railroads enable the country to open new "farms, to settle a vast number of immigrants "upon cheap land, and thus to add largely to the "yearly product of grain, cotton and provisions. "But this is not an unqualified blessing. If the "country already produces as much of these great "staples as it can consume and market, each new "farm in the Far West threatens to take the mar"ket from a farmer in older States, where land is "less fresh and fertile and more costly. The west"ward migration of thousands of farmers from "States this side of the Mississippi to the Far "West, which goes on with great activity every "year when new lands are being opened to settle"ment by new railroads, is not an unmixed benefit. "The newer States produce more, but the older "less; land in the newer States becomes more valu"able, but farms in the older States are constantly "offered for sale at prices which discourage neigh"boring holders. The aggregate production of "certain staples is increased, but at a time when "it is questionable whether foreign markets can "be found for the entire surplus already produced, "and at the expense of a greater dispersion of "the population. The social and educational dis"advantages involved by this constant migration "to new and sparsely settled regions are not to be "disregarded. We lay a broader foundation, but, "for the present at least, rear a less solid super"structure."

Well, what of this? Our business is to take due account of the conditions under which national prosperity is possible. The secret of our advancement as a people is that "no pent up Utica contracts our powers." No nation can flourish under unchanged conditions. The very perturbance which necessitates change is a law of life. The extent to which the older States are affected by the tillage of new lands brought into use by railways is but as dust in the balance in counting up the aggregate gains. As to over production with reference to markets, it is a sheer impossibility for agriculture to regulate its operations by the speculative interests of the Produce Exchanges. Besides, what about the seasons? With an increased area given to corn and wheat last year, we had a heavy deficiency in crops, which in restricting our exports abroad has told seriously on the prosperity of the country. That many of the new roads must wait for the settlement of the regions through which they run, and development of resources before they can return profits to investors is true, but, so far as the public is concerned, they must be considered as "unqualified benefits."

A MOST interesting lecture has been delivered at the Crystal Palace, London, by Professor Silvanus Thomson, on the electric transmission of power. Electricians, he said, had known for 50 years that an engine could be made to work by electric currents. They had known for nearly a century that such currents might be carried to any desired distance, without diminution of strength, by means of insulated metal wires, but it was only within the last five or six years that we have realized what an enormous power might be transmitted to great distances through a comparatively thin wire. All or any of many different kinds of dynamo would serve as a motor, and when supplied with a strong electric current from some independent source, could be set in rotation and be made to do mechanical work for which steam or other power would be required. Electric motors were shown in the Crystal Palace sawing planks, driving sewing machines, turning lathes, and working printing presses and other machinery. They can be utilized to work elevators, and even may be taken down by a diver to aid him in recovering a sunken ship. The great advantage of electric railway and tramway systems is the relatively very light weight of the engine, which is less than 50 pounds of dead weight per horse power—far less than any steam or gas engine. The difficulty in all the suggested systems of electric railways is that of getting the electric currents conveyed without loss into the engine. Electricity can now be transmitted by wires, rendering its porterage by carrying heavy cells superfluous. It is only to carry a leading wire from the central works, where the currents are generated, to the workshop where they are wanted, and small electric motors are just as economical as large ones. Once let there be a great central electrical supply—as there must be if whole towns are to be lighted up by electricity,—and the distribution of power electrically must inevitably follow, as it will undoubtedly supersede steam in small workshops, if not in large ones too. In the near future electricity is to be our servant, to do the hard work of the world in the place of our present servants, coal and steam. It appears that among the advantages we are to derive from electrical railways, is the establishment of a complete block system,—that much needed desideratum in railway traffic. The proposal is to divide the leading line through which the engine draws its supply of currents, into a number of separate sections, each insulated from the other, each section being supplied with the current by means of a buried cable, with which it is put into temporary contact only when the train is on that section. These contacts being automatically made by the moving train itself, there would be the remarkable additional advantage in this system that it would work as an absolute and automatic block system,

in which it would be impossible for one train to follow another, so that both trains should be on the same section.

In contrast to the present state of affairs in iron manufactures, East and West, we witness increased activity in this line in the South. All the machine shops there are vainly trying to cope with orders, and continuous work to the extent of their utmost capacity is assured. For mill machinery generally there is an especial demand. We hear, too, of no complaints of the want of skilled workmen, a fact showing that these are following in the track of northern capital in its migration, capital being attracted by cheap coal, cheap ore, the saving on freight charges in delivery, and the advantage attending the supply of local requirements. Our contemporary the Boston *Commercial Bulletin*, remarks: "The rapid development of iron making in the South is a significant thing in the iron trade of the North and West. Hitherto the sources of supply of the large foundries, mills and manufactories using iron in Ohio, Michigan, Indiana, Illinois, and further West, have been mainly the Hanging Rock district, central Ohio, the Mahoning Valley, Pennsylvania, New York, and the Lake Superior region. Until within a year or two, Southern iron, (except the higher grades used for car wheels) has played a very small figure in this territory. Now it is used in large quantities; and in two years more, if existing conditions remain unchanged, Tennessee, Alabama and Virginia will be the controlling influence in Western trade." With her inexhaustible mines, her furnaces, foundries and machine shops, the South is rapidly advancing in her industrial career. For a long period to come, however, Pennsylvania, Ohio, New York and other northern and north-western States will be called on to fill extensive orders for machinery beyond the capacity of her own works to supply. The advancement of the South will react beneficially on the North and West as widening the scope of trade.

THE action of several of the Chicago lumber yard dealers, in issuing a private cut list, has led to a schism in the Lumbermen's Exchange of that city. The discussion which preceded the resignation of several prominent bears was of the raciest order, the arguments for and against the official list being intensified in energy by the personal "situation." Fictitious lists are never desirable nor to the interests of trade, but in all the lumber centers of distribution there is manifestly a divergence of opinion which actual results alone can determine. The visible supply, the general state of our home and foreign trade, the extent of the season's crops are all elements in the question of prices. Renewed activity in general industry would infuse new life into the lumber trade and send up prices.

IT is the falling off in our export of breadstuffs that mainly occasions the present large outflow of gold. Taking, for instance, April last, we find that the exports of breadstuffs in that month were $9,835,205, against $20,421,008 in April of last year, a loss of $10,585,803. But for Pacific shipments of grain to Europe the drain on our gold bullion would have been larger. Cotton certainly did not come to the rescue, the shipment in April last being a fifth of that of April, 1881. Any important improvement in the condition of our foreign trade can only come from a redundant harvest. Let a large yield, of which there is a strong expectancy, be assured, and prices will fall to the point at which grain may be profitably exported, thus reversing the adverse balance.

MANUFACTURES.

TO MACHINISTS, MANUFACTURERS AND OTHERS.

THE publishers of THE TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised befor sendin to press.

OHIO INDUSTRIES.

THE Steubenville Pottery Co. are about to erect two new kilns.

POST & Co., Cincinnati, have increased their capital from $120,000 to $300,000.

THE Parker Carriage Goods Co., Cincinnati, has been incorporated with a capital of $30,000.

THE Wrought Iron Bridge Co., Canton, has completed an iron highway bridge on Plymouth avenue in Minneapolis, Minn.; it has three spans.

ACCORDING to the annual report of the Board of Trade of Cincinnati the total value of goods manufactured in that city during the year is $200,079,867.

JOHN F. BYERS, machinist, Ravenna, has had a busy and prosperous season in the manufacture of machinery. The building is a two-story brick, 30x40 feet.

A LARGE amount of boxed pork, shipped from New York to Antwerp a few months ago, has been shipped back again, the price being higher at home than abroad.

THE Brooks Locomotive Works at Dunkirk now employ about 1,000 men in the works, which are running night and day. Eighteen engines are turned out every month.

THE Barney & Smith manufacturing company, Dayton, is completing a large order for passenger and sleeping cars for the St. Paul, Minneapolis & Manitoba Railroad

THE Buckeye Engine Co., Salem, are building two engines of 24x48 and 28x56 respectively, which are to take the place of the Corliss Centennial engines now in use by the Pullman Car Co.

JOHN F. STEELE, the decorator, East Liverpool, continues to fire one kiln per day, even during the present dull state of the trade. Among other orders which he has now in hand is a large one from Morley & Co.'s Pioneer Pottery, Wellsville.

THE citizens of Ashtabula have proposed to the New York, Chicago & St. Louis Railroad Company to donate all the land necessary, and $10,000 cash if the Company will locate its eastern terminus and repair shops at that city. This is the new trunk line between Chicago and New York.

THE Whipple Manufacturing Co., Cleveland, have completed their extensive works for the manufacture of builders' hardware. Among their specialties are Butler's adjustable door spring and spring hinges, and the Sterling anti-friction barn door hangers.

THE following Ohio companies have been incorporated: The Vienna Baking Co.; capital $15,000.——The American Electric Brush Co., Cleveland; capital $100,000.——The Buckeye Novelty Manufacturing Co., of Columbus; capital $50,000.——The Spring-field Casket and Furniture Co.; capital $50,000.

THE Hughes Cultivator Co., Hamilton, have done a fair business in the past year, and are expecting a heavy trade this year. They manufacture as a specialty the Hughes caster rolling coulter, with patent hub aud clamp and the Mead tucker attachment. Over 50,000 of these coulters are said to be in use, giving entire satisfaction.

AT Brown's Flouring Mills, Mansfield, is carried on the new Hungarian porcelain roller process, in which no millstones are used. These mills, which present an imposing appearance, were enlarged and improved in 1881, and remodelled in 1882. Their capacity is 400 barrels per day. The "Standard" brand produced is considered equal to the best winter wheat flour made in the world. The proprietors are Hicks, Brown & Co. The mills are running to their full capacity.

THE Wrought Iron Bridge Co., Canton, carry on works established in 1864. The present stock company was organized in 1870. About three acres of ground are occupied. The main building is 54x368 feet, one 100x150 feet, and another 50x150 feet. Sixteen forges are used and 140 hands required in the works, and 140 employed at erecting bridges.

THE business of H. W. Werts & Co., carriage manufactures, Canton, was established in 1859. In 1864 Mr. Stebbins retired, and Mr. D. J. King was admitted to a partnership. He retired in 1871, and since that time the establishment has been run under the name of H. W. Werts & Co. The building occupied is a three story brick with basement, 45x115 feet, with a two-story addition 35x75 feet.

THE Ravenna Mill Co., established in 1881, has the most modern machinery, propelled by a 50-horse power engine. The building is three stories, 30x70 feet, and contains four runs of stone, three for the manufacture of flour and one for feed. The capacity of the mill is 75 barrels of flour per day, and manufactured by the "new patent process." The special brands are "Gem," "Amber," "Straight Grade" and "New Process." The trade of this house extends principally to the Eastern States.

OUR Sandusky correspondent writes: An extensive trade is carried on by the Sandusky Wheel Co., manufacturers of the Sarven wheel, wood hub wheels, carriage bodies and seats and finished neck yokes. This is one of the solid enterprises of the city, constantly increasing in importance. They employ 300 hands. Their business has been carried on for 22 years. Mr. J. M. Boalt, President; Mr. C. M. Cook, Vice President and Treasurer; Mr. A. F. Hubbell, Superintendent, and Mr. O. B. Bannister, Secretary.

THE Enterprise Glass Company, Ravenna, manufacture all descriptions of annealed glass chimneys. The company was incorporated in 1878. The main building is 55x60 feet; packing room, 20x40 feet; two warehouses, one 30x100 feet, and the other 30x75 feet. The works were first started with a six-pot furnace; also, a new annealing oven has been added. Employment is given to 110 hands. The capacity is 1,300 boxes per week, and the products of the works are shipped all over the United States.

MESSRS. E. & R. Knapp, Ravenna, are carrying on a thriving business in well and cistern pumps, water pipe, &c. Their works were established in 1875, and are fitted up with the best improved machinery known in the market. The products of the house are known as "Wood Force Pump" and "Common Wooden Pump." Porcelain and iron lining is made a specialty. The facilities of the establishment insure the best class of work at the least possible expense. The trade of the house extends throughout Ohio and Pennsylvania, and some goods have been shipped to North Carolina and West Virginia.

ELBEL, GILLIAM & Co., manufacturers of saddlery hardware, Canton, conduct a business of great magnitude. The grounds occupied cover an area of two acres. The main building is 50x225, two stories; one 42x80 feet, two stories; foundry, 83x110; another, 60x150 feet, and another 80x85 feet; the boiler house is 36 feet square, and the blacksmith shop 34x80 feet, besides the office and other small outbuildings. These buildings were formerly occupied by the Aldine Press Works. These works were removed from Pittsburgh to Canton in 1881. All kinds of saddlery hardware are manufactured, and 170 hands are given steady employment. Two engines are used, of 60 and 30-horse power.

ONE of the prominent and leading industries in Ravenna are the machine shops of R. Doig. The business was established nine years ago, and is located on the corner of Prospect and Spruce streets. The building occupied is 32x53 feet, and has had added a new brick foundry 35x40 feet. The machinery with which the works are equipped is of the very best, and the class of work executed embraces plows, plow points, flower vases and castings of every description. The work of this house is celebrated for its excellence, and the trade extends in all directions. Mr. Doig has had experience in the business since since 1850, and has been a resident of this city since 1870. In conclusion, it is but just to say that among the many men engaged in business in Ravenna, none have achieved a reputation and standing more desirable than his.

C. H. BURTON, manufacturer of Burton's Patent Steam Pumps, corner Main and Center streets, Cleveland, established his business in 1870, and employs nine hands. He has long enjoyed a good local trade, and has at present all the business he can do. Shipments of his patent steam pumps are made to some of the surrounding States. He has lately moved into his new buildings, having been burned out last December. The new works, stocked with the latest improved machines, afford increased facilities which Mr. Burton will put to full account. The Burton Patent Steam Pump is remarkable for its power in reference to size, due to the principles on which it is constructed, and once adopted is invariably continued in use. A special feature is its outside auxiliary valve motion, which can be advantageously applied to all descriptions of pumps. All kinds of repairing is done promptly at the works, in a workmanlike manner and at reasonable rates.

AMONG the notable and enterprising manufacturers of Ravenna is the Diamond Glass Works Co. These works were established in 1869 by D. C. Colman and George Robinson. In 1874 Mr. Holcomb was admitted to the firm, and in 1879 Mr. Robinson retired, and from that time to the present the business has been carried on by the present proprietors. Window glass is the product of these works, and the goods manufactured by this firm are highly esteemed for strength, lustre and freedom from flaws and bubbles, and are in demand throughout the Western States, where the bulk of the trade lies. A ten foot furnace is used and the main building is 80x100 feet, packing and cutting house 40x80 feet, warehouse 40x80 feet, office, clay and mixing rooms 30x120 feet. They manufacture their own boxes and melting pots, and give employment to sixty hands.

These buildings are complete throughout, as they were erected for the purpose now used, and are fitted up with all the latest improved machinery, and all work turned out is first-class and strictly handmade. Employment is given to 25 hands, who are all skilled workmen. The demand for the products of this house is great throughout the Central and Western States as far west as Utah. At the present time there is a stock of the finest finished work in the repository, including carriages, buggies and spring wagons; also a number of the celebrated Courtland spring wagons. Mr. H. W. Werts has had 34 years' experience in the business, and what he does not know about it is hardly worth knowing. The following are the features of this firm's work: First, highest perfection in mechanical construction; second, graceful symmetry of proportion; third, solidity of workmanship; fourth, display of perfect taste which is seen in all the details of finish.

THE business of Willis & Benskin, lumber dealers and manufacturers of sash, doors, blinds, etc., Canton, was established in 1867. The mill is located on Eighth street; the lumber yard covers an area of two acres; the planing mill is two stories, 40x110 feet, and is fitted up with all the latest improved machinery, and everything belonging to planing mill work is finished in first class style. The engine used is 40 horse yower. They carry an extensive stock of all kinds of hard and soft lumber. The yards are so located that they have convenient access to three railroads, one running through the yards and one on each side. Their excellent manner of transacting business and general superiority of their productions have gained for them a reputation. Business has increased every year since established, and last year their sales aggregated $75,000. Employment is given to 45 men.

THE Miller Co., Canton, manufacturers of steam pumps and farm bells, afford a striking instance of the successful prosecution of a particular line of business, by the possession on the part of its members of an intimate acquaintance with every detail, derived from long and practical experience. The establishment of the Miller Company wears at all times the air of enterprise and activity. Their Torrent and Unique steam pumps are used on portable and stationary engines. They have been located in Canton but three years, but in this short time the works have assumed mammoth proportions, and rank with the very largest industries of the city or State. This company employs 80 men, and send their goods to all parts of the United States and Canada; in fact, it is said that these pumps are extensively copied all through Canada, their merits being so conspicuous and the demand for them so great. They have recently purchased the original Burrall corn-sheller patterns, and will soon be prepared to supply the trade and the farming community with the first corn-sheller in use.

RHODE ISLAND.

THE leather nail or button is made at Providence to the number of 30,000 or 50,000 per day, according to design and finish. Every button is subjected to eight different processes. By machinery made for the purpose the nail or brad is firmly attached to the button. Another machine turns this brad into an eye when buttons are desired instead of nails. The nails and buttons are made in various styles and colors, to harmonize with any covering. The fact that the nail can be driven without breaking the brad and without injury to its head is in its favor. Pullman cars, fine furniture in hotels and elsewhere are decorated with the leather button or nail to the exclusion of the brass nail, which has declined 50 per cent. in price in consequence of the better button competition. The nails or buttons are made from the refuse or clippings of sole leather obtained from the boot and shoe districts of Massachusetts.

AT Harris's mills,the foundry in process of erection by the Harris Manufacturing Co. is nearly completed.

CONNECTICUT.

THE Postal Telegraph Co., whose shops cover several acres of ground at Ansona, Conn., have begun operations. Their process covers the preparation and copper plating of drawn steel wire, using the dynamo machines made by Wallace & Son, of Ansona. They commenced operations on 1,000 miles of wire, the weight of the wire being 200 pounds. The telegraphic system for which this wire is prepared will effect the transmission of 1,000 words per minute.

AT Winsted, the Henry Spring Co. are filling a large order for their patent single leaf carriage springs to be shipped to Norway. The stock used in these springs, or a large portion of it, is imported from Norway, and converted into steel in this country. Thus, in the regular course of trade, it finds its way home in the shape of Yankee manufactured articles.

MORTON'S Water Wheel Regulator, manufactured by James Morton, Norwich, has been put into the mills of several of the leading manufacturing companies of New England, and it is safe to say, has given eminent satisfaction.

THE Waterbury Brass Company, of Waterbury, is building an addition, 45x75 feet, two stories high, to its mill. New rolls are to be placed in the main building, requiring other space for the shear machinery, which will be located in the new building, first floor. The second floor of this annex will be used as a machine shop.

NEW YORK.

THE Burden Iron Works, of Troy, give employment to 2,300 men. They propose to greatly enlarge their works during the coming summer.

WE recently visited Ramapo, a thriving town on the line of the New York, Lake Erie & Western, 33 miles from New York. It is situated in the heart of a picturesque region, environed by towering mountains that possess historic interest as being a point of observation from which Washington watched the British fleet during the revolutionary struggle, and traversed by the Ramapo river, which furnishes abundant water power. The well-known works of the Ramapo Wheel and Foundry Company were located here about 16 years ago, and recently an important addition to the industrial establishments of that vicinity has been made by the completion of the Ramapo Iron Works, which are now in very active operation. The Ramapo Wheel and Foundry Co. is extensively engaged in the manufacture of chilled wheels for locomotives, tenders, parlor, sleeping, passenger and freight cars, and the Congdon brake-shoe. Its wheels have long enjoyed a deservedly high reputation on account of the excellent quality of the iron used, and great care taken in every process of manufacture for the purpose of insuring the best results. A large proportion of the orders executed are for passenger and locomotive service, and many orders have been filled for wheels exported to Spain, Cuba, Brazil, the western coast of South America, Mexico and Canada. The 42-inch wheel for passenger service was also first manufactured here, and a considerable number of them are now in use with excellent reported results. Many of the Ramapo wheels of the 33-inch pattern have rendered an immense amount of service. One which was removed from the Pullman palace cars in 1876 or 1877 had run more than 236,000 miles; a number have run more than 200,000 miles; many have made over 150,000 miles, and a very large number have materially exceeded 100,000 miles.

MR. H. E. LIGHT has purchased the entire business and interests of the Eureka Steam Heating Company, Rochester, under the co-partnership existing between M. H. Light and F. Farley, and announces that he will be pleased to receive the same liberal patronage bestowed on the old Company, and to serve all persons favoring him with their orders. We have had occasion to speak highly of the Eureka boilers, direct, indirect and window radiation, (Light's patents,) which are favorably known for their superior effectiveness all over the Union. Mr. Light is filling at the present time large contracts for the ventilation of buildings, as to which he furnishes, when required, plans and specifications. He has been all along as engineer and manager, the practical head of the company. At the works all kinds of steam goods, and these of the best quality, are supplied. The rapid advance of business in the past is a good augury for the future.

C. DOTTENWEICH, lager beer brewer, Olean, reports trade good the past season, and anticipates a lively trade. He brews about 4,000 barrels per year. The fine quality of his production has largely recommended it.

MAINE.

THERE is a boom in the manufacturing interests of Maine. The manufacture of textile fabrics is said to be rapidly increasing. Large and extensive additions have been made to existing mills, and several new ones are erecting.

THE shovel-handle factory of the Messrs. Turner, Dexter, is proving quite an addition to the business of the place. Thur far some 6,000 dozen handles have been manufactured, of the 10,000 dozen which will constitute the season's work.

MASSACHUSETTS.

THE new albumen factory at Osterville is approaching completion, and the machinery for the same will be ready in a few months. It is said that the country is to put $200,000 into the business. Contracts have been made with several large fishing firms at Gloucester to furnish the raw material, which consists of the spawn or roe of the fish. The spawn is manufactured into albumen; the sac that contains the spawn is converted into isinglass and the refuse is made into gelatine. This albumen is used as a sizing for print cloths, and is worth about $1 a pound. It is said to be superior to egg albumen, which is now extensively used, and is an imported article.

THE Suffolk Iron Works of Boston have been incorporated with William Butterfield as president, and James G. Drew as treasurer. Their business is to carry on, with a capital of $100,000, the casting, annealing and finishing of metals, and other cognate operations.

THE Columbia Rubber Company, Boston, of which Seman Klous is president and Augustus N. Loring, treasurer, has been incorporated with a capital of $25,000 for the manufacture, buying and selling of goods composed wholly or in part of rubber.

THE Douglas Ax Works, East Douglas, have at the present time in their employ about 460 men. The average pay roll is about $20,000 per month. They have orders enough to keep their help going until January 1, 1883.

ONE of the largest chain works in New England is to be found in Charlestown, and considerable work is now being turned out of all kinds and ranging in size from three-eigths to two and one-eighth inches. Just now they are filling a special order in the production of a two and three-quarters inch cable, which is one of the heaviest ever made in this section of the country. It is to be used in hauling vessels into the marine railway dry dock at East Boston. When completed its length will be 230 feet, composed of 62-pound links, and will weigh nearly ten tons. It will be tested at 100 tons pressure, and it may be stated in this connection that they are the only concern in the city who test every chain by hydraulic pressure before its delivery. They have a capacity of

eighteen fires, and are about to put in a twenty-horse engine for blowing them.—*Boston Commercial Bulletin.*

PENNSYLVANIA.

THE erection of the buildings for the new Pennsylvania Bolt and Nut Co.'s works has been commenced at Lebanon. All the machinery is ready, and manufacturing operations will be commenced in six months.

A SINGLE coke making and shipping firm in Pittsburgh paid out $907,000 in freights to the Baltimore & Ohio and the Pennsylvania railroad companies in one year.

TEN companies at Pittsburgh own sixteen blast furnaces, employ 2,285 hands and turn out $8,766,493 worth of product in a year. The capital invested by these ten companies is $4,830,000. Thirty-six establishments have $19,000,000 invested in rolling mills, and employ 8,965 hands, whose united labor produces $30,242,257 worth of iron of various grades. There are seventeen steel establishments, with a capital of $10,170,000, an annual product of $18,378,836, and giving employment to 7,060 hands.

GLASS shingle works are to be started in Pittsburgh.

FIVE firms are engaged at Pittsburgh, in the sand and cobble stone business, with an invested capital of over $100,000, employing upwards of one hundred men. From the beds of the rivers between 800,000 and 900,000 bushels of sand and gravel are yearly taken. Cobble stones are secured about seventy-five miles up the Alleghany river.

THE people of Easton have nearly enough money subscribed to build and fit up a silk mill.

VIRGINIA.

THE Crozier Steel and Iron Works, with a capital of $1,000,000, has begun the location of its works at Roanoke, Va. The works will be completed on or about the 1st of January. The furnace stack will stand 165 feet high. The capacity of the works, when in full blast, will be 100 tons of pig iron per day, requiring 125 cars to convey material to and from the works. The works will cover 55 acres of land, and 2,500,000 brick will be required in constructing the buildings.

EIGHTY thousand dollars worth of machinery has been purchased for the Roanoke Machine and Car Works. It is expected that the works will be ready for business by August 1.

MARYLAND.

THE Walker Horse Shoe Co., Baltimore, have received this week 84 tons or over four carloads of their patent machinery, tools, etc., to be used in the manufacture of horse and mule shoes. The company are pushing their arrangements, so as to commence manufacturing shoes at the earliest day possible, and all their machinery, engines, boilers, etc., are ready to be placed in position as soon as the building is finished. The company are sinking one of Leach's patent artesian wells, and expect a flow of 30,000 gallons per day.

A CAPITALIST of Pennsylvania, named Hunt, is negotiating with the Messrs. Ahl for the purchase or lease of Antietam Iron Works. Among the possible improvements are an additional furnace and a branch railroad from the works to connect with the Shenandoah Valley.

MESSRS. L. P. Clark & Sons, Baltimore, are engaged in manufacturing patent hydrants and water closets, for which great superiority is claimed. They have shipped large quantities of these goods to Cincinnati, San Francisco and other cities. This firm have also established a brass foundry and are manufacturing a variety of goods from that material.

MICHIGAN.

A BOILER shop 90x45 feet is being added to the Iron Bay Foundry, Marquette.

AMONG the new industries to be started at East Saginaw are a large saw and file works, an axe and tool factory, and a large furniture factory. Some of the old concerns are being enlarged and their capacity increased, showing that the march of the industries of Michigan's great salt metropolis is upward and onward.

INDIANA.

THE Eagle Machine Works, Indianapolis, have constructed and sold this season 60 traction engines for threshers and other farm uses, 175 portable engines, 250 saw mills and 375 threshing machines. They employ 200 men and are running full time.

ILLINOIS.

THE Fire Extinguisher Manufacturing Co., Chicago, are working 75 hands in the manufacture of Babcock and Champion engines, and hand extinguishers of the same name, and a large variety of fire apparatus of all kinds.

THE Columbia Iron Works, Chicago, are building a 16-ton double-bar Horning patent shears for the Pullman Palace Car Co., and have recently improved their works by putting in new machinery.

THE Vulcan Iron Works, Chicago, have just completed a Skinner steam hammer for the Quincy Mining Co. of Hancock, Mich., and are engaged on other heavy work.

WISCONSIN.

THE Bell & Thomas Manufacturing Company has been incorporated for the purpose of doing a brass and metal business at Milwaukee, Wis., capital, $50,000.

MISSOURI.

THE French Window Glass Manufacturing Co., St. Louis, are running eight pots, and use from 12 to 15 tons of sand per week. The annual production of glass is 30,000 boxes of 50 feet each, and the wages paid employes amounts to $55,000 per year.

THE Pullman Car Works, St. Louis, are now running with a force of 300 men. The shops, which cost the company over $100,000, have been in operation since last fall and are exclusively engaged in repairing, repainting and renovating the cars of the company run over the roads centering in St. Louis. The monthly expenses of the works average about $20,000.

SOUTH CAROLINA.

THE Charleston Baggage Manufacturing Co. has increased its capital to $300,000, and is doing thrice the business it did last spring. It turns out weekly 17,000 rolls of bagging used for cotton.

TENNESSEE.

THE Roanoke Iron Co., Chattanooga, are making double turn, turning out 200 tons of steel rails per 24 hours. Three electric lights have recently been put into these works, facilitating night yarding; 700 men are employed; last month's pay roll amounted to $23,000.

THE Tennessee Handle Co. is a new industrial concern organized in Chattanooga for the manufacture of axe, pick, auger, machinists', house carpenters' and coal miners' handles. The factory is expected to be in operation by the 1st of August next, and will have a capacity of 300 dozen handles per day.

EMBOSSING METAL.—Three different processes of embossing metal were used by the Greeks in the production of their silver-work. The first was that of beating by the hammer thin plates into various forms. A thin sheet of metal was placed on a kind of cement, and it was then worked on with blunt punches, the ornament or figure being raised by the ground being sunk; it was, in fact, what is now called *repousse* work. The second process used by the Greeks was that of engraving the surface of the work with a sharp tool, or chasing; and the third was that of inlaying one metal into another, or what is termed damascening. The word *repousse* is equivalent to the term "repulse," or "beat back," and that is just the operation necessitated in executing *repousse* work in metal. It is a common error to suppose that this beautiful raised work is the result of beating the metal forward from the back; the very reverse is the case, as *repousse* work is accomplished by knocking back the metal from the front surface, and not knocking the designs out from the back, as is almost generally supposed. The results of the untiring patience and perseverance displayed by the artisans entrusted with this superior work are simply astonishing, the charming effects resulting from beating back the surface until a bold design or a correct portrait is brought out in high relief, perfect in finish, and fine as sculptured marble. To the uninitiated it appears utterly impossible that such results can be secured by means of the hammer and the tool which beats against the metal surface, but the achievements speak for themselves, and very eloquently too.

MINES AND MINING.

THE Chrysolite, Col., made a settlement in May for 1,200 tons of ore; receipts $52,625.

PROCEEDS from the Homestake mine, Dakota, of bullion for the month of April, $111,958. Dividends paid $50,000; total surplus April 30, $320,043.

THE copper product of the Montana, Colorado, Parrott, Longmaid, and Bell smelters, and the Ramsdell, St. Lawrence and one or two other mines in Montana, is nearly 10,000 tons per year, nearly half of the total product of the Lake Superior mines last year.

A GOLD belt extends all through the western half of North Carolina, and as facilities for transportation are afforded, now being rapidly done, we may look for a gold boom all through the section, as well as one of iron, copper, etc.

THE total yield of precious metals in Colorado, for 1881, amounts to $22,680,685. Of this amount the various smelters, stamp mills, reduction works and sampling mills of Leadville, sent out in bullion and ore a coin value of $13,100,861.

THE ore of the Copper Mountain mine, Agua Fria district, Arizona, is pronounced by competent judges to be simply immense, both as to size and richness. A working assay shows over $260 to the ton in copper and gold. The stock is chiefly owned in Hartford, Conn. Work will be pushed night and day.

THE total product of seven mines of the Comstock mines, Storey, Co., Nevada, as reported by the State Assessor, was for the first three months of this year $258,265.

THE Idaho Gold Mining Company have now reached their one hundred and fifty-fourth successive monthly dividend, one of seven dollars and a half per share, aggregating $13,250. Total $3,533,250.

MINING in Warren county, Va., is now or soon will be quite active. One of our correspondents writes that a wealthy company has leased lands in the vicinity of Milford (Overall) on Shenandoah Valley railroad, and opened fine veins of magnetic iron ore and manganese. Governor Foster, of Ohio, Senator Windom, and other prominent capitalists compose this company.

A LARGE party of capitalists and mine operators left Philadelphia a few days ago on an excursion to Sierra mines in Lake Valley, New Mexico, to inspect the new mill and water works just completed at that place.

THE Ohio Valley Mining Company of Cleveland lately organized for the purpose of exploring for and mining iron ore, will at once begin explorations in section 25, town 43, range —, near Crystal Falls, in the Lake Superior country.

THE Great Republic mine, Grafton, N. M., has a forty foot shaft. Some ten tons of 100 ounce silver ore have been taken out, and the main pay streak has not been touched.

No special effort has yet been made to develop the Texas coal lands, which embrace 30,000 square miles, and contain many veins that are twenty feet thick. The coal is very rich in oils.

THE Rosario Mining Company, recently organized in Texas, have a capital stock of $2,640,000. The mines proposed to be worked are the Rosario mines, noted for the richness of their ores and the length of time they have been worked by the Mexicans—175 years.

IN the gold belt of Georgia there are now nearly eighty gold mills at work. A fair estimate gives the probable yield of the belt as $3,000,000 for 1882, with a reasonable prospect of doubling this output in 1883.

NOT less than 154,184,300 tons of coal were taken out of the British mines last year, and to do this work 495,000 men were employed.

A VEIN of copper has been struck at the Baltimore and North Carolina mine, near Charlotte, N. C., ranging from a foot to two feet in thickness, of nearly pure copper ore. The shaft is 115 feet deep, at which depth the vein has been tapped, and measures as above stated.

THE Climax, Tombstone, Arizona, is down forty feet on a twelve foot ledge. Selected samples of the ore assay as high as $500 per ton.

MISCELLANEOUS RECEIPTS.

TO DISTINGUISH FALSE GEMS FROM DIAMONDS.—The following test is given by the French Academy for distinguishing false gems from diamonds. If the point of a needle or a small hole in a card, when seen through the stone, appears double, the stone is not a diamond. All colorless gems with the exception of the diamond cause a double refraction.

GOLD PAINT.—A very fine paint is obtained by mixing gold powder with copal varnish thinned with a little oil of turpentine. Before applying the gold, the ground is prepared by painting it with white lead and yellow ochre in such proportions as to imitate the color of gold as closely as possible. As soon as it is dry, the gold varnish may be put on with a camels hair brush.

JAPANESE CEMENT.—Mix some finely powdered rice with cold water so as to form a soft paste. Add boiling water, and finally boil the mixture in a pan for one or two minutes. A strong cement is thus obtained of a white color, which can be used for many purposes.

HOW TO DISTINGUISH WOOLEN AND SILK CLOTH.—The following method of separating wool and silk in woolen goods is sufficiently exact for commercial purposes: The sample is kept for a quarter of an hour in boiling water containing 5 per cent of hydrochloric acid, and is then washed and dried. The threads of the warp are then separated, if possible, from those of the weft, and examined separately as follows:—A thread is burnt; there is given off a smell like burning horn, and a thread heated with a fragment of caustic soda evolves ammonia. In this case some threads are plunged in basic zinc chloride at a boil. If they dissolve completely the threads are silk. If on adding hydrochloric acid there is a plentiful floculent precipitation, the threads are silk mixed with wool or with vegetable fibres. If nothing dissolves in zinc chloride, the threads are plunged in a boiling solution of soda, not too concentrated. If they dissolve completely, wool; if partially, wool and cotton. If no odor of burnt horn is given off, the threads consist entirely of vegetable fibres. These results may be confirmed by means of the microscope.

TRANSPARENT PAINTS FOR GLASS.—Take for a blue pigment, Prussian blue; for red, crimson, lake; for yellow, Indian yellow; for brown, burnt sienna; for black, lampblack; and for other shades a mixture of the appropriate colors. Venice turpentine 2 ounces; oil of turpentine 1 ounce, and apply with a brush. For temporary purposes fine and brilliant colors are obtained by dissolving aniline dyes in white shellac varnish, but they are fleeting colors and do not always pay for the trouble.

CEMENT FOR LEATHER BELTS.—For making cement for leather belts, take of common glue and American isinglass equal parts, and place in a glue pot. Add water to cover the whole. Soak ten hours. Then bring the mixture to a boiling heat, and add pure tannin till the whole becomes ropy or like the white of eggs. Apply warm. Buff off the grain of the leather where it is to be cemented; rub the joint surfaces solidly together, let it dry a few hours, and it is ready for use. If properly put together no rivets will be needed, as the cement is as strong as the leather.

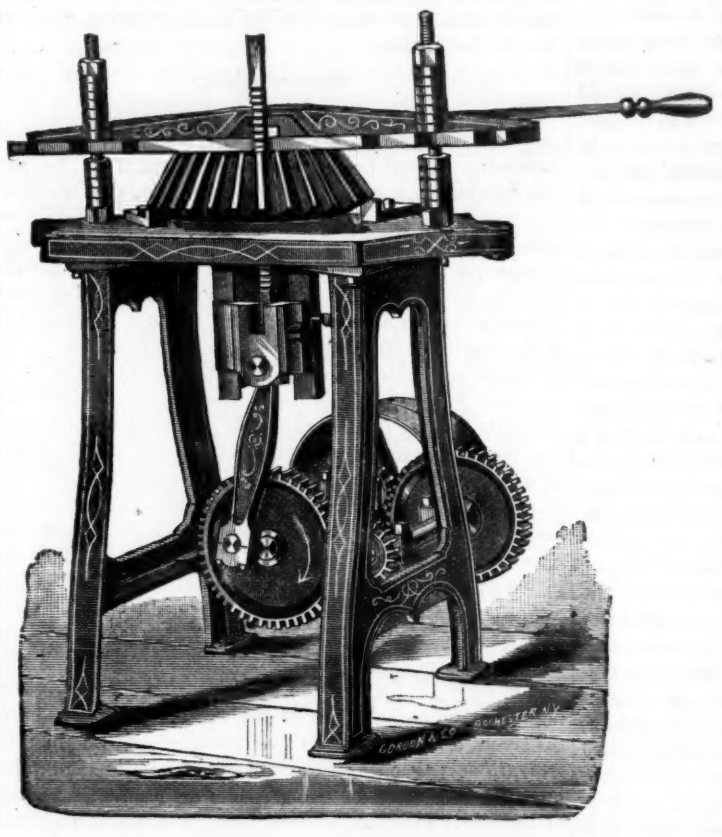
TO MAKE LEATHER IMPERMEABLE.—The following process for rendering leather impermeable, is given by M. Jacques, of Hemning, near Sarrebourg. It depends on the property of soap solution being decomposed by acids, and being transformed into fatty acids which are insoluble in water. The leather is dipped before using in a solution containing from 2½ to 5 per cent. of soap dissolved in water. The tannic acid contained in the leather, more or less, according to the method of tannin, transforms the soap solution into insoluble fatty acids, and renders the leather perfectly impermeable.

TO DEODORIZE RUBBER.—Cover the articles of rubber with charcoal dust; place them in an enclosed vessel and raise the temperature to 94° F.; let them remain thus for several hours; remove and clean the articles from the charcoal dust and they will be found free from all odor.

"BLUE GRASS ROUTE OF OHIO."—The Cleveland, Akron and Columbus Railroad.

KEY SEATER AND SLOTTING MACHINE.

The machine here illustrated is the latest improved Key Seat and Slot Cutting Machine, as made by W. P. Davis, North Bloomfield, N. Y. This machine is very powerful, and much needed in all machine shops. It will cut from ⅛ to 1 inch slots, do it much better and in one-fourth the time that the same work can be done on planer or shaping machine. This supplies a need long felt, as many manufacturers can hardly spare a planer for such work when a machine at one-tenth the cost will do the work much better and quicker. These machines have been so perfected that any man with ordinary judgment can operate them, and do four times as much work as can be done on a planer, and ten times as much as can be done by hand, and the saving in files will soon pay for a



machine when much cutting is required. As the cutting is done by saws the seats are always the same width. This machine has extension table, improved saw clamp and chuck blocks. It has been arranged with great care to give strength, durability and ease of adjustment, at a price so low that no machine shop can afford to be without one.

Mr. Davis' works present a scene of continued activity in coping with increasing orders. These works have been enlarged by the building of a foundry, and he is now adding new machinery to facilitate the manufacture of drills and key-seat cutters.

Getting Up Steam.

BY F. B. ALLEN.

The records of boiler explosions demonstrate unmistakably the importance to the steam user of the most careful supervision over boilers at the time of getting up steam. Some of the most destructive explosions of which I have any knowledge occurred either on Monday morning, or at the time of getting up steam after the boilers had been out of service; while cases in which plates are bulged, furnaces distorted, and flues and tubes badly injured, are of quite frequent occurrence, all due to ignorance and carelessness, or both, in getting up steam, or neglect of necessary precautions in filling boilers; or, having filled them, a failure to detect leaky gaskets, imperfectly closed blow-off valves, or cocks that had permitted the escape of the water before fires were lighted.

In filling boilers, I have found it a good plan to raise the safety-valve and block it open: this will permit the escape of air, besides indicating the time boilers begin to steam, after which the valve may be lowered. I have observed most stationary engineers, in charging furnaces, put the kindling-wood on the grate-bars. Another and I think a better plan is, to first scatter a thin layer of coal all over the bars—atop that the wood is placed; the latter plan, if tried, will be found a more economical and expeditious way in obtaining a good bright steaming fire.

The masonry or setting of externally fired boilers now almost universally employed in our larger cities where acqueduct water is used, is frequently ruined by heavy forced firing, when steam is first got up; the cement and mortar instead of being allowed to set properly as they would do if they slowly and judiciously heated, speedily crumble away, losing the strength of the joint; the brick wall cracks open, the draft is impaired, heat lost, and perhaps the girth seams of the boilers strained by the unequalled settling of the walls. In a few months, it is necessary to reset the boilers again, for which the innocent mason may be cursed loud and deep, the engineer in all probability being his chief accuser.

Forced firing is not only injurious to the setting, but to the boiler as well. This is most apparent in the use of the common upright or vertical tubular boiler, in which the water is carried some distance below top of tubes; the tube-heads soon begin to leak, and require frequent expanding in order to keep them tight. It will be found a good plan, when troubled in this way, to have defective tubes ferruled. Horizontal tubular boilers are often set to return heat over the top of shell; the disadvantage of this plan of setting is the danger of the exposed shell above water-line being injured in getting up steam from cold water. The shorter the boiler, the greater the danger of injury; the lower part of the boiler being at a temperature due to that of the contained water, while the upper part is exposed to that of the escaping products of combustion. A recent experience was that of three boilers 42 inches by 10 feet, used for heating purposes only, at a pressure never exceeding twenty-five pounds. Yet, under these favorable circumstances, they were ruined in about five years. More or less trouble had been experienced during the preceding season from leaks above the water-line. On examination, it was found that the upper half of the shell was badly cracked in several places; and when it was attempted to cut out the defective sheets, the surrounding metal was found so brittle and badly crystalized that the boilers were condemned. The shells below water-line had never given any trouble, and appeared to have suffered no injury during their brief service. There can be no doubt, I think, that their failure was due to the plan of setting; for they were built of selected iron, by one of our best boiler-makers, and while in service were under the care of a first-class engineer. Under less favorable circumstances, their failure would have occurred sooner. Fractures in the sheets of boilers set in this way are of common occurrence, the danger increasing with the frequency of getting up steam.

ARTIFICIAL FUEL.—Mr. W. H. Cory, who has lately arrived from Europe, has furnished the Chattanooga Tradesman some interesting facts regarding his artificial fuel, which is calculated to effect a great saving to coal miners, and to the users of coal for manufacturing purposes. According to census report, 34 per cent. of the entire output of anthracite coal in Pennsylvania is small coal or culm, which at present has no marketable value and is thrown aside as waste. The process consists of first mixing the culm with 3 per cent. of fine dry fire-clay, adding 4 per cent. of silicate of soda or silicate of potash in solution at a specific gravity of 1.3. The three materials are then thoroughly mixed, and submitted to a pressure of one ton per square inch of the block surface. The blocks on coming from the press are sufficiently hard to admit of being freely handled, and in twenty-four hours (without heat) become as hard as the lump coal, as during that time the chemical action has taken place converting the silicate of soda or potash into silicate of aluminia, which forms the powerfully binding property of the mixture. For bituminous small coal it would be unnecessary to employ so much chemical, for the reason that upon such fuel being placed in the furnace the coal would coke and thus assist in holding the particles together. Some of the advantages are summarized, as cheapness, simplicity, and ease of manufacture; the fuel is better than lump-coal, and will do 7 per cent. more work.

PRACTICAL MECHANICS.

Wheel Making.

BY HOWARD M. DUBOIS.

We know by practical experiment that to draw or move any load upon a level surface requires the expenditure of about 50 per cent. of the weight. By the leverage gained by the use of wheels upon an axle, the same load may be moved by an expenditure of about 3 per cent. of the weight. Wheels are made to overcome loss of power by friction, and until the advent of the flying machine we need look no further for improvement in the principle of the device, but confine ourselves to improvement in details of construction. In what way can we secure the most service from wheels with the least expenditure of power? This is the kernel of the nut which we are to crack, and the great end for which we are to use the means. There are several conditions necessary in good wheel making. First, we must have wheels properly proportioned. The hubs, spokes and rims should be of the proper shape to enable them to carry a given load under conditions of every-day use. The next point to be considered is the quality of the material entering into the wheels, and last of all comes the general appearance or style. It would be considered foolish for a shoemaker to endeavor to make good shoes from poor leather, or for a tailor to make durable clothing out of shoddy. For in these cases quality of the material is the radical point, but in wheel making quality of material is secondary. Even with the very choicest material it is not always that good results can be obtained unless we have skilled and competent labor. As to proportioning I could not fully canvass each different size of wheel, and shall confine myself to proportioning a light wheel. The proportions I shall state contain the principles underlying all wheels, and are safe for general use.

The first and foundation principle is the axle. This is the point around which the wheel revolves. The size of this axle governs to a great extent our hub in its length and diameter. We must bear in mind that true economy in the running of a wheel consists in using an axle that produces the least friction; that an axle in order to carry the greatest amount of lubricating material should be as large as possible. We will select as our example an axle of $\frac{7}{8}$ in. diameter. This is safe to carry from 400 to 500 pounds weight. We will now proceed to construct a properly proportioned wheel upon this axle. The length of wearing surface, the axle arm, measures $5\frac{1}{2}$ inches from inside of collar to inside of nut. In making our hub of proper size we must allow for counter-sinking the swell on the box which covers this collar, and this gives the actual length of the hub to be used as 6 inches. I will show why the axle arm is not made shorter. The wheels, when standing on an inclination of one to twelve, do not carry the weight squarely down through the spokes, but at an angle. It is an engineer's aim not to have what is termed an overhung bearing. Every journal and box must be long enough to have the weight to be carried fall inside the wearing surface, no matter what the inclination may be. By measuring the angle made you will perceive it measures $2\frac{1}{2}$ inches to the centre of the box in the hub, and as a portion of the weight must be borne by the upper wheel the figures must be doubled, which gives 5 inches. To this we add an allowance of $\frac{1}{2}$ inch, making our axle arm $5\frac{1}{2}$ inches, as previously stated. Then as to length of hub. The limit for turning on front band on a hub of this length is five-eighths of an inch. Anything less it would not be well to use. Anything less than a space of $\frac{5}{8}$ of an inch solid wood would not give enough wood to hold the strain of the end thrust to which the spokes in the hub of the wheel are subjected. The length of the face mortise, in this case should be 15-16ths of an inch. The depth of the back band is generally made $\frac{3}{4}$ of an inch deep for this size of hub. Next comes the question of proper diameters. Taking the thickness of an ordinary axle box, we find its average thickness is $\frac{1}{8}$ of an inch. Reason teaches that the ends of the spokes must not rest upon this box, and accordingly we make an allowance of $\frac{1}{8}$ of an inch. We stated the axle will bear a certain amount of load, and also that the spoke is required to correspond with this load limit. Next we come to the mortises which are to hold the tenons of the spokes. Wheel makers do not all aggree on this point, but it is accepted by all that it is not safe to remove more than one-half the amount of wood in making these mortises. I think it is advisable to leave a little more than this amount. Using 14 spokes, in my opinion, gives the best results. By making the mortises 5-16 inch full the amount of surface from the bottom of the mortise to the top, is more than one inch, the amount absolutely called for by our proportions.

We now come to proportioning the diameter of the front band. We will take for our band $2\frac{1}{2}$ inches, and give as a reason that there should be not less than one-half of the spoke tenon in the solid wood comprising the length of the hub. When the front bands are made small for the sake of appearance and beauty we are sacrificing strength, which cannot be done safely. The back band is usually made $\frac{1}{4}$ inch larger. We now will give the proper appearance to the finished wheel. There should be a certain amount of stagger used in all light wheels. One-half inch is about the proper amount in wheels of this size. There may be cases such as very high wheels used in sulkies and the like, where more than this amount can be used to advantage. More than this amount is, however, seldom employed in fine work. We will now say something about the shape these mortises should be made. The face portion or that toward the front of the hub is supposed to be perfectly true. It is better for certain reasons to have the front mortise dished a little, as the spokes in being forced down will settle back. A very important point in this matter of the mortise is to have the corners cut out cleanly. Care should also be used in selecting the quality of material in the hub, this being the foundation of the wheel.

Small Engines.

The great variety of industry to which light steam power can be advantageously applied has produced a constantly increasing demand for small engines and boilers. To meet this demand it is of importance that they be of moderate first cost, and of greater importance that they should be economical of fuel, attendance and repairs; but of still greater importance than all these, that they be so constructed that they can be run with safety by others than skilled engineers. Among the great numbers professing to effect all these ends it is exceedingly difficult for a person inexperienced in use of steam, and desiring to purchase, to decide which is the one best adapted to his use. Every manufacturer will naturally be very liable to think his own production the best, also very likely to fail to see the good points or advantages of other manufacturers; but the intelligent buyers will carefully weigh the best advantages of the different patterns and designs, and be governed by their own judgment and common sense, as in other purchases. They will look with suspicion upon the statements of manufacturers of boilers with large shells and riveted seams, that "they cannot explode." It is a fact generally known that the ordinary wrought iron boiler with riveted seams possesses at the greatest only from fifty to sixty per cent. of the strength of the iron forming the shell; in consequence of the cutting away of the iron for rivets, &c. So that cast-iron being of only one-half the strength of wrought iron, even if reduced to the same thickness, in consequence of being able to dispense with the use of the rivets which impairs the strength of the wrought iron shell would still be its equal in strength. But cast-iron being a poor conductor of heat does not do as well for the heating surface of a boiler as wrought iron. The most popular style of boilers in use among other manufacturers, in consequence of the less expense of production, is the upright tubular boiler: consisting of a large wrought iron shell, with a fire-box at the base inside, and filled with vertical tubes extending from and through the crown sheet over the fire-box to the top of the boiler; the water extending up only a portion of their entire length, leaving the upper portion of the tubes and the entire upper flue sheet exposed to the full force and effect of the heat without the protection of the water, or, when raising steam, even the steam. This is frequently sufficient to make this portion of the boiler red hot, and by the difference in expansion of the shell—which is not exposed to the direct heat of the heat of the fire—and the over heated tubes they are strained or loosened where they pass through the flue sheet, and a bad leak is the inevitable consequence, which, if not attended to at once, will corrode the iron; and the life of the boiler, which, (if properly constructed) should last twenty years, is limited to three or four years, and in many cases even less than that. Another and perhaps greater objection to this class of boilers seems to be poor economy of fuel, in consequence of the necessary shortness of the tubes, which cannot be remedied without making the height of the boiler objectionable; and the heat being allowed to pass directly upward through them, and into the chimney, but a small proportion of it is absorbed, and hence a very great and constant waste of fuel. Another, and in many respects better style is the horizontal tubular boiler, with an arch or setting of wrought or cast-iron, with the fire directly under the shell, and the heat returning through the tubes which extend its entire length, to the smoke box, which is generally attached to the end of the end of the boiler and directly over the fire-door. Although, as before stated, we consider these boilers in many respects superior to the upright, there are a few serious objections to even these; which it seems difficult to remedy, and use it as a portable boiler.

No small engine can be made to work as economically as a larger one; for the reason that the loss by condensation and friction is much greater in proportion; and a two or four-horse power engine will use much more fuel per horse power than would be required by one of the best construction of 100-horse power.

The form of the engine known as the vertical inverted engine obtains a wide preference for its compactness as admitting of a distribution of the iron in such a manner as to give the greatest strength and rigidity for the amount of material used. The vertical engine possesses all advantages of the horizontal for almost every conceivable use, while it is peculiarly fitted for many purposes where the horizontal could not be used at all; in consequence of the greater amount of space required for setting and operating it. In fact there is no other style of engine made for setting and operating it. In fact there is no other style of engine made occupying so little space; and with the framing so well adapted to the strains to which it is subjected, or in which the friction is so small or the endurance of the parts so well attained. The engine should not be fastened to or upon the boiler, so that it may not be affected by expansion of heat, nor the hearings be overheated by conduction, or ascending heat from the boiler. The shaft and fly-wheel, if at the base secure steadiness uuder the high speed which is necessary for economy of fuel. It should be so constructed as to allow of easy and convenient access for cleaning and repairs, so as not to disturb any of the healing pipes, or those connecting with the engine pump or boiler. The exhaust steam may be advantageously discharged through a blast pipe in the stocks as in locomotive practice, increasing the draft and efficiency of the boiler.

A Visit to the Crewe Railway Works of England.

The members of the Manchester Association of Employers and Foremen lately visited the Crewe Works of the London and North Western Railway Company. These works are among the largest and most complete of their kind, with the most extensive foundry in the world. We give a sketch of the visit, the works illustrating the almost complete absence of what may be termed hard manual labor, by the employment of an infinite variety of machinery for manipulating nearly every piece of work, and affording some valuable mechanical hints. The arranged route commenced with the fitting shop, where specimens of the locomotive cylinders, now cast in pairs, were seen. By this arrangement the cylinders are not only produced at less cost, but the joint, which was always a source of trouble in the old cylinders cast singly is dispensed with. In connection with the new cylinders special machinery has been designed for planing up the valve faces and for boring the slam ports, which attracted considerable interest.

Passing on to the wheel and axle shop, a number of excellent tools were seen in operation, including a crank turning lathe with seven tools, a machine designed by Mr. Ramsbottom, the late locomotive superintendent, for roughing out the throws of cranks, and a quartering machine, designed by Mr. Webb, for forcing wheels on to the axles and ensuring their being at the proper angle. In the same shop the light travelling jib-cranes for lifting the wheels and axles into the lathes and other machines were a very interesting piece of mechanism. These trains travel along a single rail on the shop floor parallel with the lathes, &c., and are supported at the top by guide rods in the roof. They are driven by a light cotton cord about $\frac{5}{8}$ in. diameter, and travel along the floor at the rate of 80 feet per minute, and lift their loads at the rate of 9 feet per minute. In Nos. 3 and 4 erecting shops the operation of removing an engine by means of a couple of overhead cranes, worked by power and under the control of one man, was witnessed. An excellent collection of hydraulic riveting apparatus, both for heavy and light work, slotting machines for dealing with eight locomotive frames simultaneously, and drilling machines by which four frames are drilled at the same time, were also at work; these frames were entirely of steel, and are rolled in one plate. The smithy and forge contains 113 smiths' fires and 19 steam hammers ranging from $2\frac{1}{2}$ cwt. to as many tons. Amongst the special appliances here is a machine for drawing off the buckle from old springs by hydraulic power without injuring the buckle to new springs. The system of forgings which were to be seen were exceedingly clean, in fact with many of them very little further tooling is required. The extensive joiners' shops and saw mills contain the modern wood-making tools, designed both for rapidity of work and economy in manipulation, an illustration of which was afforded by the taking out in one solid piece of timber, to be afterwards utilized, the portion of a signal post in which the semaphores are fixed. The millwrights' shop, in which the manufacture and repair of shafting, and the construction of cranes, warehouse machinery, and stationary engines, is carried on, would form a not unimportant engineer's works of itself, and is fitted up with all the general class of modern tools. The steel works are capable of producing 30,000 tons of steel per annum, and the Bessemer and Siemens-Martins processes of making steel were seen in operation. In the

rolling mills a leading object of interest is a 14 in. mill, rolling fish-plates, which are passed on to machines for sawing, filing, punching and straightening. The rolling of steel rails, and straightening, drilling, and ending machines were also seen at work, and then passing on to the point and crossing shops, a number of machines were open to inspection which had been specially designed for this class of work. The boiler shop contained a collection of special plant of the highest class, and attention was directed to Mr. Webb's patent for flanging the outside and underside plate at the firing hole, so as to dispense with the ordinary water ring, which is certainly a very great improvement. This alteration requires a special machine, which has been well designed for drilling both plates at the same time, and a special riveter has also been introduced for riveting the fire hole door. The high class material manufactured at Crewe enables it all to be manipulated by flanging machinery, and the boiler ends forming the front, as well as other portions of the fire-box plates, are flanged in one heat by hydraulic presses in a few seconds. One very powerful hydraulic machine which attracted attention was a press by which the fire-door hole, measuring about 3 ft. by 2ft. 6 in., was punched out of the plate, cold, in one operation. In doing this the plate is brought in contact with the punch by hydraulic pressure of 350 lbs. to the square inch, this is then, by means of an intensifier, increased up to 1,800 lbs. to the square inch, at which pressure the punch is carried through the plate. The 5, 6, 7, and 8 erecting shops contain mounted boilers and a number of special machines made at Crewe. These include machines by which six horn blocks are refaced on both sides at the same time, and the machines being supported on the locomotive frames by templets, correctness of all the centres is secured. There are also machines for reboring the cylinders in place, and refacing the valves, the whole of the machines being driven by a cord from the line shaft. The new foundry, which has just been added to the works, covers a site of 420 feet by 120 feet.

There are three pairs of rails for overhead traveling cranes. Two cranes, capable of lifting ten tons, and four five-ton cranes have been put up. The foundry is to be provided with five cupolas, and under the platform at both ends are capacious drying stoves. At one end of the building is a pit in which it will be possible to make vertically a casting forty feet long, and hydraulic power will be provided for lifting out the metal. The whole of the foundry machinery will be driven by a wall engine, and the steam will be supplied by three locomotive stationary boilers, which will obviate the necessity of tall chimneys. In the engine-room are two blowers, from either of which a powerful blast may be obtained for any of the cupolas at will.

From the new foundry the party proceeded to the steel and the iron forges, in which were shearing machines, a plate mill rolling steel locomotive frame plates, an axle mill, a toothless saw cutting steel angles (solid) which was watched with considerable interest, an 8-ton hammer, forging crank axles, a 50-cwt. hammer forging piston rods, a 30-ton duplex hammer for boiler plate slabs, and a 10-ton duplex hammer for jumping waggon tyres, a 50-cwt. hammer for punching, and a 5-ton hammer for backing the tyres, a tyre rolling mill, and 7-ft. saw for hot slabs. In the iron forge were a 3-ton and 50-cwt. hammers, 14-in. and 6-in. guide mill, working saw and scrap cutting and cleaning machine.

Story of a Great Monopoly.

[From the Atlantic Monthly.]

[Continued.]

Vanderbilt signed an agreement, March 25, 1872, that "all agreements for the transportation of oil after this date shall be upon a basis of perfect equality," and ever since has given the Standard special rates and privileges. He has paid it back in rebates millions of dollars, which have enabled it to crush out all competitors, although many of them, like the Octave Oil Company and the Titusville refiners, had done all their business over his road till they went into bankruptcy, broken by his contracts with the Standard. He united with the Erie in a war on the Pennsylvania Railroad, to force it to sell to the Standard all its refineries, and the great pipe lines by which the oil, like Croton water in the mains, was carried from the wells to the railroads. He then joined with the Erie and the Pennsylvania in a similar attack on the Baltimore & Ohio, which had to sell out to the Standard. So the Standard obtained the control of all the pipe lines and of the transportation, of everything, in fact, as a witness said before the New York Railroad Investigating Committee, except the bodies of the producers. Mr. Vanderbilt began, as did the Erie and Pennsylvania railroad kings, with paying back to the Standard, but to no other shipper, ten per cent. of its freight bills. He continued making one concession after another, till when he was doing the business for other shippers at $1.40 and $1.25 a barrel, he charged the Standard only eighty and eighty-one cents, and this was afterwards reduced to sixty cents a barrel. During the war against the Pennsylvania road to make it sell out to the Standard, the New York Central carried oil for less than nothing. Besides the other allowances, Mr. Vanderbilt paid the Standard through its allies, the American Transfer Company, a rebate of thirty-five cents a barrel on all the crude oil shipped by it or its competitors. When the oil producers, whom the Standard had cut off from all access to the world except through it, sought an exit through an out-of-the-way railroad and the Erie Canal, or down the Ohio River hundreds of miles to Huntingdon, thence by the Chesapeake & Ohio Railroad to Richmond, and so to the sea, Mr. Vanderbilt lowered his rates to the Standard so that it could undersell anyone who used these devious routes. When the producers, June, 1879, completed their own tidewater pipe line, 104 miles long, to a junction with the Reading Railroad, obtaining in this way a direct connection with the seaboard, Mr. Vanderbilt reduced his rate to the public from $1.40 to $1.25 a barrel to thirty-five and twenty-five cents, and charged the Standard twenty, fifteen, finally but ten cents. For ten cents Mr; Vanderbilt hauled for the Standard a barrel weighing 390 pounds over 400 miles, and hauled back the empty cars, at the same time that he charged forty-five cents for hauling a can of milk weighing ninety pounds for sixty miles. So closely had the Standard octopus gripped itself about Mr. Vanderbilt that even at the outside rates its competitors could not get transportation from him. He allowed the Standard to become the owner of all the oil cars run over his road, and of all his terminal facilities for oil. As the Standard owned all but 200 of the oil cars run on the Erie, and leased all that road's terminal facilities, it could charge its rivals anything it pleased for the privileges of New York harbor. When Mr. Vanderbilt was questioned by Mr. Simon Sterne, of the New York committee, about these and other things, his answers were, "I don't remember," to 116 questions out of 249 by actual count. At a time when the Standard Oil Company through its other self, the American Transfer Company, was receiving from the New York Central thirty-five cents a barrel on all oil shipped by itself or its competitors, and was getting other rebates which cost the New York Central over $2,000,000 from October 17, 1877, to March 31, 1879, Mr. Vanderbilt testified positively before the New York Investigating Committee that he knew nothing whatever about the American Transfer Company, its officers, or the payments to it.

The Standard's control of the Erie was not less complete than its hold of the New York Central. The Erie shipped only ten cars for outsiders in a whole year, and those were taken by mistake. Although a public corporation and a common carrier, the Erie let the Standard sink hundreds of wells on its road-bed, and steal the oil of the neighboring wells. After promising cars, of which it had hundreds idle, to independent shippers, the Erie withdrew them at the dictation of the Standard. One shipper had 10,000 barrels of oil brought down to the side of the track by pipe line to be put into cars promised him by the Erie. The agent of the Standard appeared and stopped the shipment. When this shipper told his story, months later, before the New York committee the oil had not been shipped, though meanwhile the market value of oil had gone down thirty per cent. In giving the Standard special rates, rebates, and the like, the Erie followed the same course as the New York Central and the Pennsylvania Railroads.

When the Pennsylvania railroad began its discriminations against the oil producers, they appealed to President Scott for equal rates with the Standard. At the interview they obtained after repeated solicitations, he answered their petition by recommending them to make a compromise with the Standard Oil Company! He did not want, he said, to get into any trouble with that concern. Representing the greatest common carrier under the constitution of Pennsylvania, which expressly provides that everybody shall have "equal rights" on the railroads of the State, President Scott actually offered to get from the Standard Oil Company for the shippers the privilege of transportation over his own road. He volunteered his personal services to mediate between the Pennsylvania Railroad and the Standard. More American than he, they refused the proposed service. One of them, a New York refiner, in describing the scene, says: "We gave him very distinctly to understand that we didn't propose to go into any 'fix up,' where we would lose our identity, or sell out, or be under anybody else's thumb." President Scott told these outsiders that they could not have the same rate as the Standard, not even if they shipped the same amount of oil, and refused to tell them what discriminations were being made. He refused to give them transportation or to let them put their own cars on the road, although they had been his heaviest customers in the years when the Standard was an ally of his competitors in one of the fiercest railroad wars ever waged between the trunk lines.

[To be continued.]

MECHANICAL RECEIPTS AND ITEMS

Coating Iron and Steel with Irridescent Copper.

This important invention, says the Revue Polytechnique, is by Dr. Well, of Paris. The inventor has found that the best mode for preparing the metalizing bath and the best proportion of ingredients are indicated in the following directions: First, 35 parts of crystalized sulphate, or an equivalent amount of any other salt of copper, are precipitated as hydrated oxide by means of caustic soda or some other suitable alkaline base; this oxide of copper is to be added to a solution of 150 parts of Rochelle salts, and dissolved in 1,000 parts of water; to this, 60 parts of best caustic soda containing about 70 per cent. NaO are to be added, when a clear solution of copper will be formed. The object to be coppered is to be cleaned with a scratch brush in an alkaline-organic bath attached as a cathode, immersed in the coppering bath, and treated with the usual precautions, when it will become rapidly coated with an adherent film of metallic copper. As the bath gradually loses its copper, oxide of copper, as above prepared, should be added, to maintain it in a condition of activity; but the quantity of copper introduced should ordinarily exceed that prescribed as compared with the quantity of tartaric acid the bath may contain. If the quantity of copper notably exceeds this proportion, certain metallic irisations are produced on the surface of the object. These effects may be employed either for ornamental or artistic purposes. According to the time of the immersion, the strength of the current, and the proportion of copper to the tartaric acid, the irridescenes may be varied or intermingled by shielding certain parts of the object by an impermeable coating of paraffine or varnish, while the irridescent effect is being produced on the parts left exposed. All colors, from that of brass to bronze, scarlet, blue and green, may be thus produced at will. If it be desired to deposit nickel, the only modification of the above process requisite is the substitution of precipitated oxide of copper, produced by precipitation as above mentioned. In the above process it will be observed that the introduction of sulphuric acid into the bath is avoided, at least except in such insignificant quantities as may still adhere to the precipitated metallic oxides.

To Prevent the Cracking of Cast Steel.

To prevent the cracking of cast steel in hardening, a correspondent of the "Metal Arbeiter" places the article first in a tin box, where it is packed with clean wrought iron drillings, and after luting the box carefully he heats the whole slowly to a dark red heat. After cooling it very gradually he finds that all internal strains which otherwise would have developed cracks in the tool during hardening are removed, and when steel to be hardened is thus annealed no further trouble is experienced.

To Remove Soft Solder.

Take proto-sulphate of iron, 2 oz.; nitrate of potassa, 1 oz; and water 10 oz. Reduce the proto-sulphate of iron (green copperas) and nitrate of potassa (saltpetre) to a fine powder, then add these ingredients to the water, and boil the preparation in a cast-iron saucepan for some time; afterwards allow the liquid to cool, and in doing so it will shoot into fine crystals; if any of the liquid should remain uncrystallised, pour it from the crystals and again heat it, when, on cooling a second time, it will all have become crystallized. The crystallized salt should then be taken and dissolved in muriatic acid (spirits of salts), in the proportion of one ounce of salt to eight ounces of acid. Now take of the latter preparation one ounce, and add to it four ounces of boiling water in a pipkin, keeping up the heat by the means already stated. In a short space of time the most obstinate cases of soft solder will be cleanly and entirely removed, and without the work changing color, if these instructions are properly carried out in preparing the mixture, etc.

A Solution for Silver Plating.

The following is a good bath: Soft water, 1 gallon; cyanade of potassium 8 ounces. Dissolve the silver nitrate in a small quantity of soft water, gradually add, with constant stirring, solution of cyandide of potassium until no further precipitate of silver cyanide forms) avoiding any excess of the precipitant.) Throw the precipitate on a fine cotton cloth filter, and as the liquid runs through, wash the precipitate on the cloth with pure water. Mix and dissolve this waste precipitate with water in which has previously been dissolved the cyanide of potassium. If the silver cyanide does not dissolve readily add more cyanide until it does.

Finishing the Surface of Cast Iron.

Very fine effects are produced on unfinished cast-iron by a mixture of petroleum with French yellow, the result being a fine bronze yellow, not liable to ordinary wear, and, if applied hot, filling the pores of the metal, defying anything short of the file or planer tool to obliterate i

Iron and Steel Making Processes.

BY PERCIVAL ROBERTS, J. R., M. E.

In advocating the use of high qualities of steel and enumerating the advantages to be derived by employing it, the fact is frequently lost sight of that this superior metal is made from the highest grades of pig, obtained with the greatest care from the purest ores, and that the succeeding processes are worked out with the aid of the most improved plant. The metal is followed through all details of manipulation with the most thorough inspection and right chemical and mechanical tests. Material thus obtained is compared with wrought iron made from anything and everything. No chemist mixes the charge or analyses the process, but a puddler is left to guard the interests at the most vital stage of the process, whose aim it is to produce the greatest weight, with the least labor, in as short a time as possible, and with such work no one can blame him. It is not astonishing that under such conditions iron is so much inferior in its physical qualities to steel. Of course, even taking the same grade of pig metal for the manufacture of wrought iron as is now used for steel making, the mild grades of the latter suitable for structural purposes will no doubt give higher results by mechanical tests, but the difference between the two will not be as great as many are apt to think.

On the other hand, if in the future, by means of dephosphorizing processes, we shall use all sorts of pig iron for steel, shall we not introduce an element of uncertainty into its manufacture which we do not have to deal with at present, and whose influence may be most dangerous? When it is considered how very slight a change in the per centage of some foreign substance may produce such a considerable variation in the quality of steel, uniformity in a metal derived from such impure raw materials cannot but be strongly questioned. The homogeneous nature of steel, as compared with the many-pieced structure of iron is claimed as one of its advantages. Homogeneity in iron its weakness, yet its strength. A steel bloom, to all external appearance perfect, may be within entirely bad, either from piping in the molds, or from other causes of a similar nature. Chemical analysis will not show this defect, and a bar produced from the same, although sound as far as can be seen, may fail in service suddenly and without warning. On the other hand the possibility of a wholly bad iron bar diminishes just in proportion as the number of pieces in the pile from which it is made increases. For a material for structural purposes, the term "uniformity" should take the place of "homogeneity." A material exposed to abrasion, such as a rail receives, requires the latter quality, but one subjected to strains of compression and extension, torsion and bending, wants uniformity more than any other attribute. If one bad member is contained in a structure, the strength and homogeneity of the whole is of no avail.

The aim of those interested should be to work out, if possible, a more rational system than the one at present in general use, one whose results will be uniform and which requires mechanical means instead of human power. The question to be solved is not one of lightening the labor of the puddler, but one of doing away with skilled labor altogether. The rotary process is the only one which up to the present time, has aimed at any such results, and yet its success is open to doubt, although the fact that a Sellers plant is being put up at the Edge Moor Works seem to indicate that the proprietors have great confidence in its success. Some of the more important objections to the system are that from its very nature it cannot be a very economical one, the wear and tear of the complicated mechanism and revolving surfaces being necessarily great, and the lining being of a material ill adapted to resist heat. The quality of the iron, however, is good, and counterbalances many of the attending disadvantages, although it will not, as was at one time hoped, answer for making bars without weld. It must be cut and piled as ordinary iron, or the work upon it will not suffice for good results.

No change in the old and present system of puddling will occur until a process is worked out which entirely does away with the skill of the puddler as at present exercised. That the rotary system has done this is true; but there are many drawbacks to be contended with in its working. For the operation of any new process aiming at this result, great and costly operations in existing plant will be necessary, alterations which in the present condition of the metallurgy of iron would be neither wise nor expedient. We are now in the midst of an epoch of uncertainty; a few years more and the success or failure of steel to supplant wrought iron will be established beyond a doubt. Its success depends upon the results which shall be obtained from the working of all grades of pig iron, and its failure is certain if uniform quality cannot be produced. For the present, therefore, the system of puddling must continue as of old; but every ironmaster, not only of this, but of all other countries, will most gladly welcome the process, whether it be of steel or of iron, which shall supplant the weary toil of so many thousands, and usher in a brighter and a better era than could ever be accomplished by the puddling process as invented by Henry Cort.

RAILROADS AND TRAFFIC.

VANDERBILT is reported to have told a friend that the earnings of the Lake Shore for May were but $47,000 less than the earnings for the same month last year, while those of the New York Central fell off but $87,000.

SUPERINTENDENTS of the Southwestern lines expect to begin shipping new wheat within a fortnight.

THE Railroad Gazette of June 9th reports for the week a total of 119¾ miles of new railroad, making 4,323 miles thus far this year, against 1,574 miles reported at the corresponding time in 1881, 1,590 miles in 1880, 661 miles in 1879, 413 miles in 1878, 570 miles in 1877, 628 miles in 1876, 296 miles in 1875, 537 miles in 1874 and 1,171 miles in 1873.

A MATTER of interest to the shipper as well as the railway stockholder is the announcement that west bound freight rates will probably be advanced to double the present figures on the 1st of July. What the tariff will be remains to be seen, but it will probably be not less than 60 cents per hundred pounds on first class freight, which would be double the present rate. Some officials urge a still higher rate, say 75 cents per hundred. Sixty cents per hundred would give the companies about $120 per car for hauling freight from New York to Chicago. —*Cleveland Herald.*

ANOTHER Boston railroad in Mexico, the "Bee Line" both ends of which are in the United States, is the last project practically commenced. It begins at National City, three miles from San Diego, in California, at the present terminus of the California Southern Railroad, and runs southeast through northern Mexico 470 miles to Calacasas, Ariz, running only 12 miles in the United States at the west end.

THE line of the Connotton Valley Railroad is nearly ready for rails from Canton to Coshocton.

BUT ninety miles of track-laying remain to be done in Texas to make the through connection between San Francisco and New Orleans.

ARRANGEMENTS have been made by which the New York, Pennsylvania & Ohio Railroad Co. will obtain an entrance into Toledo by the track of the Wheeling & Lake Erie as soon as the latter is completed into the city and terminal facilities established, which will be done probably before the middle of July. It is claimed that this will give another direct route to New York, 697 miles in length, the shortest yet opened. The N. Y., P. & O. will connect with the Wheeling & Lake Erie at Creston, 57 miles southeast of Cincinnati, and with the Erie at Salamanca, N. Y. Other lines will soon effect an entrance to Toledo over the Wheeling & Lake Erie. One of these, no doubt, is the Baltimore & Ohio. Some of the high officials of the Chesageake & Ohio and the Scioto Valley roads have been reconnoitering Toledo's water and grain shipping facilities.

A LIMITED ticket is no longer limited, and the railways have to resort to other devices to prevent travelers from getting too much for their money. The Court of Appeals declares that a man holding one of these special tickets can start at any intermediate point between the cities named on the coupon, but that then his journey must be continuous. And if the ticket is accepted by a conductor on the last day on which the company declares that it is "good," the traveler can go through on the contract thus made, even if he does not reach the end of his trip until after the "limited" time has expired.

A Celebrated Cutlery Manufactory.

Sheffield, England.

It is fitting that Joseph Rodgers & Sons, of Sheffield, England, the most patriarchal firm of any standing in the trade to-day, and the owners of the mark of the star and cross—a mark which exacts a tribute of respect alike from the Afghan mountaineer, the spear striking Caffir, the island cannibal and the civilized housewife—should erect what is undoubtedly the most complete and perfect cutlery manufactory in the world. Soon after the centennary of the establishment of the firm had gone by, the necessity of providing new premises for the overflow of business forced itself to the front in the minds of the directors. Another building besides that of the Round Hill branch was erected, dedicated to a section of the table knife and the whole of the pocket knife department, and arranged in system, as to the machinery which it contains, so as to include every known improvement and appliance worth introducing. A plain brick building, with stone dressings and a bold frontage, the Pond Hill branch is entered at the center under an archway, guarded, as usual, by high gates and a vigilant janitor. A large quadrangle is flanked on either side by the main wings, dotted in the center by a small block consisting of stamping shops and necessary outbuildings. A little beyond is the boiler pit and shed, fitted with two enormous boilers, and the yard is closed in at the top with a low building divided into sections, embracing machinery for producing table blades, and shops for scale cutters, bolster hands, &c. Intersecting the angle on either side is an engine house fed from the pair of boilers in the yard. Here two superb twins of steam—the "Alice" and the "Evelyn"—polished to a silvery sheen, and lagged with polished wood, generate the motive power of the premises. Not a speck of "matter in the wrong place" is permitted to mar the gloss of this glazed sanctum of steam, and the governors are so constructed that the sudden cessation of every hand in the place would fail to excite a single wheel or band into undue velocity—a most important provision when it is remembered how great is the danger from the breaking of over-strained stones. A door through the upper end of this quadrangle opens upon the forger's yard, which is compactly covered with neat two storied forges, with hearths placed back to back. Going back to the lower end of the right wing and entering the basement one arrives at a long bench upon which is affixed a series of wondrous little machines, engaged in doing what appears to be most complicated work in wood scales in the simplest possible way. These ingenious pieces of mechanism are employed upon the handles of certain classes of table and butchers' knives, &c. Drilling, countersinking, shaping and cross-cutting are here done with amazing rapidity, precision and finish. Here also is a small foundry supplying a silvery metal, which is run around the bolster and into the rivet holes of special classes of table-knives, securing beautiful finish and unbreakable strength. In the upper stories the finishing stage of the cutlers' craft are gone through, and presently we cross a landing, find ourselves in the street side of the square, where, as well as in the upper floors of the left wing, pocket-knives hold sway. A tour through this department excites wonder at the extraordinary divisions and subdivisions which this branch undergoes. Blades, bolsters, springs, scales (of iron, brass, bone, horn, wood and ivory), all, first separately, and then as a coherent whole, pass through an inconceivable number of hands before they are stacked in the warehouse boxes and parcelled for the shelves. As in the table-knife department, there is on this side of the building a close shop reserved for a few specially skilled and ingenious hands, in whose trusty minds repose the secrets and specialties of the department. The basement of the left wing forms the grinding hull, than which it would be hard to imagine a more scientifically devised home for the most hopelessly dirty and disagreeable portion of the cutlery manufacture. Lofty ceilings, abundant light, warming apparatus, substantial walls, ventilation, revolving fans for the attraction and discharge of dust and filings, are all characteristics of the place on a scale worthy of the name and fame of Joseph Rodgers & Sons, and the 500 hands employed at Pond Hill have reason on this, if on no other, account to congratulate themselves on serving the premier cutlery house.

ITEMS OF INTEREST.

OUR exports of dried apples amounts to some 6,000,000 pounds.

AN advance in sperm oil is a feature of trade the other side of the water.

A NEW sugar refinery has been built at San Francisco at a cost of $1,500,000.

SINCE the opening of navigation over 35,000,000 feet of lumber has been shipped from Muskegon.

THERE is 70,000 pounds of peppermint produced in this country annually, and of this amount two-thirds is produced in Wayne county, N. Y.

IT is stated there are 40,000,000 pounds of axle grease made and sold annually in the United States, representing a money value of $1,000,000.

THE Trent Valley Canal scheme to connect Lakes Huron and Ontario, a distance of 236 miles to Trenton, Bay of Quinte, is being vigorously pushed.

A SEALING steamer has arrived at Newfoundland with 24,000 seals, and the catch of the whole fleet off Labrador is reported to be as great as 136,000.

THE Germans adulterate their papers with clay to such an extent that the American market now refuses to import German paper. Clay ruins type and is generally undesirable.

A FEW years ago there was not a single bicycle in the United States, and now there are over 12,000. Several large manufactories are building the machines, and they are overwhelmed with orders.

THE value of manufactured products in the United States according to the census returns, was, in 1850, $1,019,106,616; in 1860, $1,885,861,676; in 1870 ,$4,532,325,442.and in 1880 a little over $8,000,000,000.

A LARGE paper manufacturer in New York says that an American mill can, in a given time with an equal number of men, turn out 40 per cent. more paper than either an English, French, Belgian or German manufactory.

A LARGE number of the best silk weavers from European silk centres are arriving in Paterson, N. J., by every steamer, driven out by the starvation wages paid in their native towns. The difference in wages, as nearly as can be ascertained, ranges from fifty to one hundred per cent.

WE produce annually in the United States 250,000,000 pounds of sugar, while we consume 2,200,000,000, or more than eight times the amount of our production. In fact we received for duties alone on foreign sugar more than three times the value of all the sugar we produce.

A LARGE linen manufacturer of Belfast, Ireland is seeking a factory site in New England. He says over half of his raw material comes from this country now, and is manufactured and sent back here. He thinks he can make money by bringing his machinery and skilled labor to this country. He employs 2,000 hands.

WHEN the total production of butter in the United States was but 1,000,000,000 pounds per annum, the average price for the finest was 10 to 12 cents per pound. Now with a total production of 1,200,000,000 pounds per annum, the price in many cities this winter has been 40 to 45 cents per pound for the best, and it has all been used at home.

THE enlargement of the Welland Canal, which commenced in 1872, is very nearly completed. The cost when finished is estimated at $13,000,000, and it will accomodate vessels of 1,000 tons. This expenditure has been made by Canada upon the supposition that the canal will divert transportation from the railroads of the United States, as well as from the Erie Canal.

THE oldest stove probably in the United States is one that warms the hall of Virginia's capitol, in Richmond. It was made in England and sent to Richmond in 1770, and warmed the house of Burgesses for sixty years before it was removed to its present location, where it has remained for thirty years. It has survived three British monarchs; has been contemporaneous with three monarchies, three republics and two imperial governments of France.

AMERICAN SAW MAKING.—When saws were first made in this country, a great deal of sawing was done by pit sawyers, and the making of pit saws was a very important branch of Hoe & Co.'s business at that time. Now pit saws are rarely made, and so small is the demand that they have been struck off the price list of saw manufacturers. The old English gate saw was in 1833 in general use for sawing logs. The saw in use was the "Row land" saw, made of "blister" steel, and from ¼ to 5-16 of an inch thick, cutting a saw kerf of from ⅜ to ½ inch, and it was considered a good mill that would cut 1,000 feet of inch boards in a day of 12 hours. The introduction of cast steel for saws permitted the use of thinner saws for sawing logs, and much difficulty was experienced in their introduction, owing to the imperfect construction of the saw gates. The natural temper of the metal being harder than the soft blister steel, cast steel saws would often break while in use, and to overcome this difficulty, the muley saw was brought out and introduced about the year 1840. It did away with the old rickety cumbersome English gate, and owing to its lightness, could be run at a greater speed up and down, the saw being guided at the top. The only strain was in the downward pull at the bottom. These saws would run without breaking, and were made to do more work in a given time with the same power than the gate saw, "usually double the amount of work." As the population of the country increased, the demand for lumber also increased. The muley mill being much faster in doing its work, rapidly took the place of the gate saw, which was too slow to meet the demands of the times. The muley mill has been improved from time to time, and made to do more and more work in a given time, but it has not been able to keep up with the requirements of the times, and the gang and circular saws have been superseding it in the lumber manufacturing districts. Circular saws for sawing logs were introduced about the same time the muley mill was brought out, but did not at first give as good results, owing to the difficulty of putting and keeping them in working order. It was much easier for those who had got accustomed to filing and setting an English gate saw to dress a muley, than it was for them to file and set a circular saw properly. It was a new trade to run circular saws, and had to be learned by practice; and as the practice required often caused the loss of much lumber and the ruining of expensive saws, it required years to introduce and popularize the circular saw, which from the start was admitted to be the fastest of all saws for sawing up logs. The muley and circular saws are American tools for converting logs and timber into boards and other sawed stuff. The pit saw and gang gate saw are English, and the single sash saw is of Dutch origin. At the commencement of the business, and up to the year 1849, very few circular saws were larger than 48 inches in diameter, and none were more than 54 inches, while even 36-inch saws were considered very large and very rarely used. In that year the first saws 60 inches in diameter were brought out, but only two were made during that year.

A NOVEL MOTOR.—An interesting engine, of which we here give a brief description, has recently been invented by Messrs. Roettger and Bay, of Brussels. Motion is produced by subjecting a compound plate, composed of two metals, the degrees of expansion of which are different, to the action of heat and cold alternately. The compound plate consists of pieces of steel (not tempered) and brass riveted one upon the other, the latter being placed below the former. Any other suitable combination of metals may, however, be used, the important point being that the expansion of the two metals should differ by an appreciable amount. By applying heat to the lower portion of the plate, it will expand and assume a convex shape as regards the source of heat. Resistance opposing this expansion may be overcome, and motion will be developed in a certain direction. When the heat applied to the plate has attained a suitable degree of intensity, the gas flame or other heating medium is removed, and the plate, on cooling, will tend to return to its original state, thus developing a further motive power. A current of cold air or a jet of water directed against the plate will accelerate this action. One end of this plate is fixed to a suitable standing in a horizontal position, while the outer acting end is connected with a lever. The long arm of this lever is jointed, at its end, to a connecting-rod which transmits the power produced to a pump, crank, or any other suitable mechanical means of utilizing the power thus communicated. By changing the length of the arm of the lever, the stroke may,of course, be varied when it is required to obtain greater power than can be produced by one of the compound plates mentioned; a series of these plates may be employed, and sources of heat other than gas may be used, such as, for example, currents of highly heated air. The apparatus, judging by present available information, has not yet been successfully utilized for practical purposes, and its general introduction appears to be extremely doubtful.

THE COMPOSITION OF STEEL FORGINGS.—At a recent meeting of the Newcastle-on-Tyne Chemical Society, Mr. T. W. Hogg read a paper on the Variation in the Composition of Steel Forgings, which gave the results of a series of analyses made by him to ascertain if there is any difference in chemical composition between the central parts and the surrounding material of steel forgings. Samples of metal were taken from a forging 7¾ inches in diameter, and formed from an ingot of three tons in weight. These were submitted to analysis in the laboratory, great care being taken to obtain comparative results. The tests showed that impure metal was contained witnin a radius of 1½ inches from the center. The general conclusion from numerous other experiments is, that "those parts of a steel forging corresponding to the middle of the ingot, contain a core of accumulated impure metal, the extent of this accumulation depending upon the size of the ingot, and the rate at which it cools." This fact is worthy of remembrance in cutting up large ingots into billets for the production of smaller articles in steel; for among these billets there will necessarily be some of very variable character This liability to vary will, of course, be reduced by casting the ingots of as small dimensions as possible.

REVIEWS.

The Atlantic Monthly for June. BOSTON: Houghton, Mifflin & Co.

The Atlantic Monthly is undoubtedly the raciest and most entertaining monthly magazine published, full of healthful and instructive reading. From January to June it has maintained the highest possible standard in original and effective stories, and articles dealing with topics of commanding interest. The June number contains a steel engraving of the late Professor Darwin, with a sketch of his life's work. The rapid progress of Communism is ably delineated. "Our Dead Singer," (Oliver Wendell Holmes) is a gem in its way. "Studies in the South," with its types of men and descriptions of scenery, will be perused with general interest. The engaging novelette, "Dr. Zay," also that of "The House of a Merchant Prince" are continued. "The Poet's Birds" must be enumerated amongst the engaging attractions, introducing the feathered songsters embalmed in song. The "Contributor's Club" contains a remarkable article throwing light on the workings of Providence. We would advise our readers to secure all the numbers issued of the current volume.

Demorest's Illustrated Magazine for July. New York: E. 14th street.

This number is one of the finest yet issued. It has numerous contributions from authors of distinguished merit, along with good short stories, biographical sketches, household matters, &c., and is replete with coming fashions, amply illustrated. There are sixty illustrations, some of which are exceedingly fine, especially the oil picture, "Sunshine and Summer Beauty," the steel engraving," "Love Asleep." Among attractive articles are "Fishing of All Kinds," "Sixty Waymarks in Universal Progress," "Woman's Work," "Lunch Parties in the County," "The Search for the Golden Fleece," Gertrude Whedon's Vocation," and "Home Art and Comfort."

A NEW industry, that of copper spinning, has been introduced by the Dover Stamping Co., Boston. A circular piece of sheet copper of ordinary thickness is placed on a lathe, and in a twinkling, without the use of hammers, shears, rivets, or soldering iron, is spun into the shape of a kettle, without a break or weakening of a single fibre of the material. Ladies' and other utensils in copper and zinc, cuspadores, etc., are formed in the same manner. The articles are made from 32-ounce copper.

SCIENCE AND INVENTION.

NEW ELECTRIC BRAKE.—Mr. Edison has taken out a patent for an electric brake, which consists essentially of a large horse shoe field magnet, much the same form as those used in his dynamo-machines, but instead of the ordinary armature a disc on the axle runs partly between the cheeks of magnetic poles, and when a circuit is made the disc, of course, revolves under a magnetic resistance, and so brings its axle to rest.

MECHANICAL STOKER.—Among other inventions for economizing fuel exhibited at the recent Smoke Abatement Exhibition in South Kensington, England, was Newton's mechanical stoker, by the use of which the coal is injected into the furnace by means of heated air. The coal is supplied at intervals to hoppers fixed in front of the boiler, and from there it passes to crushing rollers, which finally feed it to a delivery shute through which a current of hot air passes. The latter carries the coal forward into the furnace and distributes it evenly over the grate surface. The blast pipe carrying the hot air extends along one of the flues of the boiler whereby it is heated.

INCREASING THE STRENGTH OF IRON.—Two processes have been recently introduced by M. Seguin, of Paris, by which it is claimed that the resistance of iron to the various strains of which it is subjected is considerably increased. In one process the piece of iron is raised to a cherry red heat and dipped in a mixture of sulphuric acid and water. In the other process the piece is similarly heated, and quenched in a mixture of one part of turpentine and six parts of water.

MARKETS.

FINANCIAL.

Office of TRADE REVIEW AND WESTERN MACHINIST.

FRIDAY EVENING, June 16.

There has been an improvement in the demand for money. There is a full supply of loanable funds. Rates of discount at bank are 7@8 per cent; on prime collaterals money is obtained at 5 per cent. on call and 6 per cent. on specific time. Checking and depositing are fair. The requirements for Eastern exchange for mercantile purposes are light. Government bonds are dull.

NEW YORK.—The money market here has ruled easy at 2½@4 per cent. for call loans on stock collaterals, and 2@3 per cent. on government securities. Prime commercial paper is negotiated at 4½@5½ per cent.

IRON.

There have been considerable receipts at this port of iron ore. No large sales have transpired, or new contracts been made, owing to the position of the iron market. There is an advancing tendency in pig iron, as the result of the strikes. The demand for foundry iron is active. Special grades are contracted far ahead. The average price for Foundry Hanging Rock CC. is $27.00@$28.50. Scotch pig is held firmly, but sales are by no means heavy. We quote Coltness $26.00 to $26.50; Glengarnock $24.00 to $24.50. Gartsherrie $25.00 to $25.50; Summerlee $25.00 to $25.50, Carnbroe $23.00 to $23.50. In view of the advancing tendency of iron, plate manufacturers are asking an advance. Bar iron advanced 2-10ths and sheet iron 3-10ths. Tank also is improving, and buyers are paying full prices. Refined, 3¼c.; Shell, 3¾c; Flange, 4¼c.; Fire-box, 5¼. Local demand is improving, and buyers are preparing to carry larger stocks. The new orders for galvanized and common sheet iron show an improving tendency in prices; less cutting prevails. Steel rails are fluctuating. Sales have been made at $50. Some business is reported in iron rails. Quotations are $44.50 to $45.00 for heavy sections, and $46.00 to $48.50 for light rails, but some 56 lbs. rails are said to have been taken at $43.50. Spikes are still quoted at $3 per 100 lbs.; fish-plates at $2.60, and track-bolts at $3.70 for square nuts and $3.90 to $4 for hexagon.

CINCINNATI.—(Reported by Rogers, Brown & Co.) The effect of the resumption upon the market cannot be estimated yet. The pig iron consumed in Cincinnati mills is a small factor in the market, but the moral effect of resumption of work will certainly arrest the decline, and may start an upward movement that will be the signal for general buying to begin. The situation at this writing is one of expectancy. We quote at four months: Hot Blast Foundry—Hanging Rock CC. No. 1, $27.00@$28.50; No. 2, $26.00@$27.50; Southern, No. 1, $26.00@@27.00; Strong Coke, No. 1, $24.00@25.00; No. 2, $23.00@$24.00; No. 3, $22.00@$23.00; Soft Stone coal No. 1, $23.00@24.00; No. 2, $21.00@$22.50. Forge—Strong, Neutral, No. 1, Mill, $20.50@$22.00; Cold Short, No. 1 Mill, $20.00@21.00. Car Wheel and Malleable Hanging Rock Cold Blast, $33@34; Hanging Rock Warm Blast, $27@29; Southern Car Wheel Iron $34@36; Lake Superior do. $31@33; Lake Superior Malleable, $31@$33.

CINCINNATI.—(Reported by E. L. Harper & Co.)—The past week has been a very active one, especially for Gray Forge Irons, several large blocks of this grade having changed hands. Although June is usually a quiet month the trade thus far has been excellent. Stocks of strong bar and coke irons are small and in good demand. The glowing reports of the crops from the Southwest gives new assurance and a marked, hopeful feeling prevails that trade will be very satisfactory during the remainder of the year.

COPPER.

Transactions in Ingot Copper have been moderate, but prices are steadily maintained. There is no falling off in consumptive demand, but buyers are not disposed to purchase beyond current requirements. Holders ask and obtain 18⅛ cents for Lake, and in a jobbing way 18⅜, while Baltimore and other brands have been obtainable at 17 7-8 to 18 cents. In London prices are steady and market quiet. There is no change in manufactured articles. We quote Bottoms 31c@32c; Braziers, 30c@36c; Circles, 33c@36c; Sheathing, 28c, and Bolt Copper, 30c; Segment Sheets, 33c; Fire-box ditto, 30c.

LEAD.

There is little demand for Common Domestic; sales have been effected at $4.60@$4.65. Of Refined a few sales have been made at 4¼ per cent. We quote: Pipe, 7¼c; Sheet, 8c; Tin-lined Pipe, 15c; and Block, 45c; all less 10 per cent. to the trade.

TIN AND TIN PLATES.

Inactivity characterizes the market for tin. Dealers ask 21 5-8 to 21 3-4 cents for Straits and Malacca, but these figures could be shaded. London prices are steady at £97, Singapore firmer at $30.12 1-2, and Penang unchanged $29 3-8 per picul. We quote for round lots Banca 28 cents, Straits and Malacca 21 1-2 to 21 3-4, Billiton 22, Australian 21 7-8, English L. & F., 22 1-2, English Refined, none here. Tin plates are firmer. Cakes command $5.15.

SPELTER AND ZINC.

There is a moderate demand for Spelter; we quote 5 1-2 to 5 7-8 cents for Silesian and 5 5-8 to 5 70 for Domestic. Zinc has declined; both Domestic Sheet and Foreign are being bought at 7 1-4.

COAL.

Arrivals have been moderate. Lake Shipments continue on a fair scale; freights show a downward tendency. The following are the wholesale prices by the car load on track to dealers: Massillon lump, $2.75@2.85; Massillon nut, $2.50@2.60; Salineville lump, $2.25; Salineville nut, $2.00; Tuscarawas lump, $2 50; Tuscarawas nut $2.00; Straitsville lump, $2.75; Straitsville nut, $2.50; Slack, $1.45@1.65; Scranton, Lackawanna, Wilkesbarre, Pittston, Wyoming, grate and egg, $5.25; Scranton, Lackawanna, Wilkesbarre, Pittston, Wyoming, stove and Chestnut, $5.41; Lehigh, lump, $6.75@7.25; Coke, $5.00@5.25. Connotton coal is the same as Salineville.

HARDWARE.

The hardware trade is good, and prices generally are firmly maintained. The market is firm for nails; price of 10d. to 60d. is advanced to $3.40, net, per keg; strikes have stimulated purchases. No. 1 Fence Wire, standard size, is now 4¼ cents per pound. A number of modified price lists have been issued by manufacturing firms, but are not of sufficient importance to be individually noted here. Heavy sales continue to be made of barbed wire. Saws and files are in good demand. The business in carpenters' tools increases. The supply of most classes of mechanic's tools is far from meeting the demand.

WOOL.

The easier tone of the Eastern markets renders prices more favorable to buyers. This tendency, however, does not apply to the more desirable grades, which are still scarce and firm. Extra pulled wools bring very full prices, and are held with much confidence, long staple X, which can be made to supply the place of delaine fleeces having been especially sought for. In washed fleeces we quote: Ohio XX, 42@44; do. X, 41@43; do. No. 1, 45@46.

LUMBER.

PLANK, MIXED WIDTHS.

2 inch, 12, 14 and 16 feet, together.

A 1 and 2	$50
A 3	40
B	32
C	21
D	15
E	13

1¼ and 1⅜ inch.

A 1 and 2	$48
A 3	40
B select	32
C	21
D	15
E	13

BOARDS.

One Inch, mixed widths.

A 1 and 2 uppers	$44
A 3	36
B select	30
C	20
D	15
E	13

STOCK BOARDS.

12 Inches wide.

A 1 and 2	$45
A 3	38
B	32
C	21
D	16

STRIPS.

6 Inches wide.

A 1 and 2	$42
B	35
C	22
D	17
E	13
Norway Fencing Strips	17
Norway Flooring Strips	25

WORKED LUMBER

FLOORING.

Flooring—A 3	$42
B	38
C	24
D	20
Norway Flooring—A 3	28
C	22
D	18
Matched Drop Siding, 6 inches—A 3	42
B	38
C	24
D	20

Beaded Ceiling $2 higher than Flooring.

One half inch Bevel Siding—A 1 and 2	24
A 3	20
B	18
Ash Flooring—A 1 and 2	40

Lehman, Richman & Co.

IMPORTERS

AND JOBBERS OF

WOOLENS

And Manufacturers of

Men's, Youths', Boys' and Children's

CLOTHING!

86 & 88 WATER STREET, CLEVELAND, O.

invite the attention of close and short time buyers to the LARGEST STOCK between New York and Chicago, at prices guaranteed AS LOW as made by ANY responsible house in the United States.

Practical Steam and Gas Fitters.

Estimates and Specifications furnished free by

Chafer & Becker,

Practical Steam & Gas Fitters,

Particular attention given to

Railing Work, Dry Kilns, Steamboats, Rolling Mills, and every class of Pipe Fitting.

LARGE PIPE CUT TO ORDER.

LOW PRESSURE A SPECIALTY.

No. 8 Champlain Street, Cleveland, Ohio.

All orders promptly attended to. Telephone No. 1088.

BILL STUFF.

Small, joists, 12, 14 and 16 feet	$15
18 feet and under	$16
Timber, larger than 8x8 special.	
Timber, longer than 18 feet, adds about $1 per foot per M. extra.	
Cedar Posts, large	30 00
" " medium	25 00
" " small	$15 to 20 00

SHINGLES, LATH AND MILL WORK

Shingles XXX	$4 50
Clear Butts	3 25
Lath	3 00

Surfacing, one side, adds $1.25; two sides $1.50
Matching, flooring and drop sidings, $2.50.

E. Fawcett. R. B. Fawcett.

E. FAWCETT & SON,

Proprietors of

ALLIANCE INDUSTRIAL WORKS,

Manufacturers of

STEAM ENGINES,

and Circular Saw Mills.

Specialty of Portable Saw Mills and High Speed Engines.

ALLIANCE, OHIO.

COATES'

"Independent Lock Lever"

HAY AND GRAIN RAKE.

Patented August, 1867, January, 1875, June, 1875, and November, 1876. 60,000 now in use. Light touch of lever and driver's weight dumps it. Best self-dump in market. Twenty steel teeth. No complicated ratchet wheels, friction bands or other horse machinery needed to operate it. A small boy rakes easily twenty acres per day with the Coates' Lock Lever. Send for circulars.

A. W. COATES & CO.

Alliance, Ohio.

FOR SALE.

One 15-H.P., mounted Threshing Machine.
One 10-H. P. Threshing Machine.
One 8-Horse Power.

Address
NATIONAL MACHINERY CO.
Cor. Bond & Superior Streets, Cleveland, O.

L. P. SMITH. JAMES OLWELL.

SMITH & OLWELL,

General Machinists,

Manufacturers of

STEAM ENGINES.

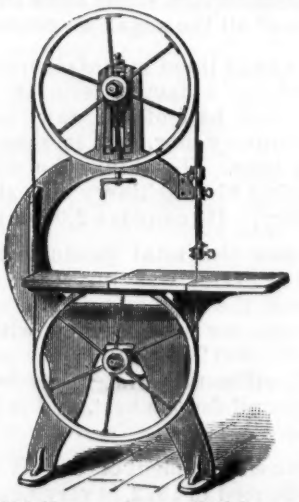
(STATIONARY AND MARINE,)

and Machinery of all descriptions.

116 Elm Street, Cleveland, O.

☞ Special attention given to Marine jobbing.

Eureka Band Saw.



We build three sizes of this machine

with 26, 30 and 38 inch wheels.

The two smaller sizes will saw hard wood 12 in. thick, the largest 16 in. thick. They are made of the best material and are well made.

For further information address
FRANK & CO.,

Manufacturers of

WOOD WORKING MACHINERY,

176 Terrace Street, BUFFALO, N. Y.

$5 STANDARD ELECTRIC BELT

gives strength to the Weak and Nervous, and will alone retain its reputation forever as the infallible conqueror of Pain and Disease. Circulars free.

AGENTS WANTED.
Standard Galvanic Co.
CLEVELAND, OHIO.

Cleveland Wholesale Prices.

HARDWARE.

Adzes.

Carpenter's.....per doz $18 40
Ship..... " " 18 75
Heavy railroad.... " " 19 50

Axes.

Hunt's.....℔ doz $ 9 50
Lippincott's Crown ℔ doz 9 00
Cut More ℔ doz 9 00
Peck's Double Bit..℔ doz 22 00
" Champion Blade ℔ doz 11 00

Anvils.

Eagle, Amer...per lb. 10c dis 20
Wright's.....10¾c@11c
Armitage's Mouse Hole 9¾@9¾c
Trenton..... 10¾c
Wilkinson's..... 10¾c

Anvil Vise and Drill.

Millers Falls Co. $28 .....dis 20
Cheney Anvil and Vise .dis 25&2

Vises.

Solid Box, list of July 1, '79, dis 35
Solid "Crown" (A. H. Hildick).....40 to 100 lb. 15c net
Solid, Peter Wright's 15¾
Solid, Wilkinson's.....13¾
Parallel, Parker's.....dis 40
Saw Filers, Hopkins' ℔ doz $17.50, dis 10
Reading .....dis 45&10
Cowell Hand Vises.....dis 20
Richardson's Vise and Anvil.....dis 25

Augurs and Bits. Dis

C S cut augurs.....40&10
do do do bits.....40&10
D C gimlet do Ives.... dis 50
Snells bits .....dis 40
Russell Jennings' augers dis 16⅔ &10&10
Cook's pat augur.....40&10

Animal Pokers.

Berea, per doz..... 4 00
Eagle, per doz..... 5 00

Apple Parers.

Domestic & Reading ℔ doz .$7 50
Turn Table..... 5 00

Bolts.

Machine..... dis 60
Bolt ends..... dis 60
Plow..... dis 50
Plow, R. B. & W.... dis 40
Cast Iron Barrel Shutter, etc .....dis 50&10
Cast Iron Chain (Sargent' list).....dis 60&10
Ives' Pat. Door Bolts... dis 50
Wrought Barrel.....dis 55&10
Wrought Square ..... dis 55&10
W'g't Shut'r, all iron, Stanley's list.....dis 50&10
Union Carriage..... dis 70
Tire, R. B. & W., new list..... .....dis 70&10
Stove, American Screw Co.'s..... dis 40

Bellows. Dis

Blacksmith's com new list, 45℔ct
Moulder's new list, dis 25 ℔ cent
Hand, new list, 25 per cent

Butts. Dis

Wrought brass..... 65&10
Cast, loose joint..... 10&10
Pin, japanned and silver tipped..... 45&10
Wrought, fast joint narrow..... 40&10
Wrought fast joint broad..... 40&10
Wrought loose joint broad..... 45&10
Wrought table and back flaps..... 40&10
Loose joint, reversible . 45&10

Cleveland Stamped Elbows

Genuine Russia Iron

4 inch per doz..... 4 50
4¼ do do 5 50
5 do do 7 50
5½ do do 8 50
6 do do 9 50
7 do do 11 00

Planished American Russia Iron

4 inch, per doz..... 4 00
4¼ do do 5 00
5 do do 6 50
5½ do do 7 50
6 do do 8 50
7 do do 9 50

Charcoal Iron

4 inch, per doz..... 2 00
4¼ do do 2 50
5 do do 3 50
5½ do do 4 00
6 do do 4 50
7 do do 5 50
25 per cent

Chisels.

Hot and cold cutting.....℔ lb 30
Railroad track 30
Machinists..... 30
Mallet head..... 50
Cape..... 50
Packing..... 50
Stone cutters..... 50

Crowbars.

Cast steel.....℔ lb 8¼
Iron, steel points..... 6¾c

Cutlery, Pocket and Table.

Meriden Cutlery Co., table..net
Am. Miller Bros.' Cutlery Co.....dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co...list net
Aaron Berkenshaw's pocket dis 25

Crucibles.

Per number..... 4@ 4¼

Chains.

Coil by cask.....

3-16	¼	5-16	⅜	7-16	½
10¾	9	8	7	6¾	6¼

Drills and Drill Stocks.

Blacksmiths', each...$2.50 dis 10
Blacksmiths', self-feeding, each 7.50 dis 20
Breast, P. S. & W .....dis 20&10

Drawing Knives.

Witherby's .....dis 65@10
Nobles Mfgr. Co 15
Adjustable handle 20

Emery and Emery Paper.

Regular Numbers.....℔ lb 6c
Flour and F. F.....℔ lb 4c
B. & A. Emery Paper..dis 30&5

Enameled and Tinned Ware.

Kettles.....dis 50
Sauce Pans.....dis 25
Tinned Sauce Pans.....dis 50

Files.

Auburn...$5 to £. dis 35 pr cent
E. M. Boynton's, new list..dis 25
J. & Riley Carr .....4.50 to £.
Johnson & Bro. .....dis 30
Butcher's.....4.50 to £.
Walter Spencer & Co.'s "Diamond".....4.50 to £.
Fisher's .....4.75 to £.
Moss & Gamble.....4.50 to £.
H. Disston & Sons (new list) ..... dis 40 per cent
Heller Bros.' Horse Rasps dis 25
Nicholson.....dis 40
New American.....dis 40
Union File Co.....dis 40

Grindstones.

Ohio .....1¼@1⅝ ℔lb
Nova Scotia.....1¼@1¾ ℔lb

Hammers.

Maydole's .....dis 15
Cheney's .....dis 25
Hartford Hammer Co.....dis 20
Humason & Beckley.....dis 50
Verree.....dis 5
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50 and $1.75, dis 25&10
Nelson Tool Works....dis 40&10
Warner & Noble's .....dis 5
Kip's .....dis 15
Yerkes & Plumb .....dis 15
Wilkinson's Smiths' 11¼c ℔ net

Hatchets.

Yerkes & Plumb:--Shingling, Nos.....1, 2, 3,
℔ doz $7 50, $8 00, $8 50, dis 25
Claw, Nos.....1, 2, 3,
℔ doz $8 25, $8 75, $9 25, dis 25
Lathing, Nos.....1, 2, 3,
℔ doz $7 50, $8 00, $8 50, dis 25

Nails.

20 to 60d.....	3 40
8 and 9d	25
6 and 7d.....	50
4 and 5d.....	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅞ inch	3 00
4d barrel	1 00
1¼ inch barrel nails.....	1 50
1¼ do do do	1 75
1 do do do	2 50
⅞ do do do	3 00

Cut spikes, all sizes..... 25
Clinch nails, all sizes..... 1 75
Casing and box nails 75 cts advance
Finishing nails, $1 25 do
Tobacco nails, 50 cts do

Nuts and Washers

Nuts, square.....7c off list.
Nuts, hexagon..... 7c. off list.
Washers.....6c off list.

Picks.

Railroad, 4 to 5 lbs....doz $7 75
5 to 6 lbs.... 7 75
to 7 lbs.... 8 50
7 to 8 lbs.... 9 50
Railroad Tamping Pick.... 7 to 8 lbs..doz 13 50
Mill Picks per lb..... 75c

Rivets.

Iron .....dis 40
Tinned.....dis 40
Copper .....dis 33⅓

Squares. Dis

Steel or iron, case lots.....50
Try squares and T bevels.....40

Spikes—WROUGHT

All lengths by ¼ inch 4¼c
do do do 5-16 ..... 3½c
do do do ⅜, 7-16 & ½ in 3¼

Shovels and Spades.

Ames' new list, July 1, 1881, ... dis 15
Old Colony.....dis 15
Remington's (Lowman's Patent).....dis 30
Rowland's .....dis 40 and 10
Griffiths ... .dis 40&10

Saw Sets.

Boynton s patent X Cut, per doz $12; Hand Saw, per doz $10.....dis 20
Stillman's Genuine, per doz $3 50 and $5 50 .....dis 20
Stillman's Imitation, per doz $3 25 .....dis 20&10
Common Lever, per doz $2 dis 30&10
Leach's No. 0 $8; No. 1 $15; dis 15
Hammer, Hotchkiss $5 50, dis 10
" Bemis & Call Co.'s new patent .....dis 40&5
Bemis & Call Co.'s Lever and Spring Hammer..dis 30&5
Bemis & Call Co.'s Plate ..dis 10
" " Cross-cut dis 12½
Aiken's Genuine...$13, dis 50&10
" Imitation.....$7, dis 50
Hart's Patent Lever.....dis 20
Disston's Circular .....dis 40

Sad Irons.

From 4 to 10 lbs....per lb 3¾ net
Self-Heating.....℔ doz $9 net
" Tailors..℔ doz $18 net
Gleason's Shield and Toilet .....dis 25
Mrs. Pott's Irons, double pointed.....dis 35
Mrs. Pott's Irons, square back.....dis 35
Enterprise Star Irons.....dis 40
Combined Fluter and Sad Iron.....℔ doz $15, dis 15

Scales.

Hatch, Counter, No. 171 ..
℔ doz. $42, dis 37½&10
Union Platform.....$6, dis 45
Fairbanks'.....dis 20
Buffalo Scale Co.....dis 20&5
Forsyth Scale Co .....dis 25
Howe's.....dis 20&10
Chatillon's Eureka.....dis 25
Family Universal.....dis 50
Scale Beams.....dis 33⅓&10

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Planes.

Ohio Tool Co.....dis 20
Sciota.....dis 25
Bailey's Pat. Adjustable..dis 25

Rules.

Stanley..... dis 66⅔ and 10

Sash Locks. Discount.

Payson Mnfg. Co. "Perfect"..42
Simmons' Sash Supporters 20

Hinges.

Champion double acting spring hinges .....dis. 30
Screw & Strap 8@12 in. ....$6. net
Gravity Locking Blind Hinges, Sargeant & Co. 70&10

Screws. Dis

Flat head iron or steel per cent dis..... 30
Flat head brass 30
Round head iron or steel.. 25
Round head brass..... 20
Brass and Silver capped .. 40
Japanned, list of Plain Screws..... 20
Coach, patent Gimlet point, list per 100 60
Lag, taper points..... 60
Bed 10
Machine, flat head, iron .. 55
round head, iron 50
Bench, iron .....55&10
wood, beech, per doz $3 10
wood, hickory .....20&10

Valves. Dis.

Jenkins' Patent Gate Valves..35
" " Globe " ..40
" Standard Packing " ..20

Wrenches.

Coe's genuine..... 40 & 10
Coe's imitation wrought bar..60
Mechanics' 60 and 10

Wire.

Brass and Copper.....dis 20
Bright & annealed, Nos. 0 @ 18 dis 50@52½
" " Nos. 19 @ 26 dis 60
" " Nos. 27 @ 36 dis 65
Coppered.....Nos. 0 @ 18, dis 45
Galvanized, Nos. 0 @ 18, market list, ...dis 40@45
Tinned, Nos. 0 @ 18, ...dis 40@45
Cast steel.....dis 40
Tinned Broom Wire, Nos. 18 @ 25.....dis 55
Annealed Fence, Nos. 8 and 9.....dis 55@52½
Annealed Grape, Nos. 10 to 14.....dis 52½
Galvanized Telegraph, Nos. 7 to 9 .....℔ lb 7½c
Galvanized Telegraph, Nos. 10 to 11 .....℔ lb 8½c
Galvanized Telegraph, No. 12.....℔ lb 10½c
Fence staples ....℔ lb 5½@5¾c
Fence Staples, galvanized, ℔ lb 7@7½c
Stubs Steel Wire... .$7 00 to £
Barb Wire, painted 8½c
Barb Wire, galvanized 9¼c
Crucible Steel Ropes from ¾ in. at 9c to 1¼ in. at.....52c
Best Selected Iron Ropes from 3-16 in. at 3c. to 1¼ in. at.....33c

Boiler Plates.

("Gaylord"--Standard Quality.)
C. No. 1.....4 50
C. H. No. 1 Shell.....4 60
C. H. No. 1, 50,000.....5 00
C. H. No. 1, 55,000.....5 50
C. H. No. 1 Flange.....6 00
Firebox .....
T. S., 60,000 .....(as per)..6 00
T. S., 65,000 .....(act of)..
Homo. Steel, 70,000 (of Cong).8 00
Heads, ¼c ℔ lb. extra.
N.B.—Eastern brands of boiler plate at from 2-10 to 3-10c ℔ lb less than above prices.

Sheet and Tank Rivets. "Norway."

All sizes.....dis. 15

Boiler Rivets—"Albany."

⅛, ¼, 11-16, and ½ in. diam.5 50

Boiler Makers' Tools.

Doty's Power Shears ....net list
" Hand Lever Shears.net list
" Power Punch.....net list
" Hand Punch .....net list
Steel Screw Punch.....net list
Iron Screw Punch .....net list
Boiler Plate Rolls.....net list
Buffalo Forges & Blowers dis 20
Watson's " " net list
Spring Tube Expander ....dis 15
Roller Tube Expander ..net list
National Tube Cleaner ...dis 20
Wire Flue Brushes .....net list
Anvils—"Peter Wright" 12½℔ lb
Solid Box Vises ..... net list

Nuts, Bolts, etc.

Square & Hex. Nuts ....7 off list
Washers .....6 off list
Machine Bolts .....dis 55
Bolt Ends .....dis 55
Boiler Patch Bolts.....net list

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch.....dis 37½
"National" Standard Gauge 11 inch to 15 inch .....dis 25
"National" Special Locomotive Tubes.....net list

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅛ to 1 inch..... 2 85
4¼ to 6 by ⅛ to 1 inch..... 3 00
1¾ to 6 by 1¼ to 1¾ inch.... 3 25
1¾ & 1¾ by ⅛ to ¾..... 3 00
1 & 1¼ by ⅛ to ¾..... 3 10
⅝ & ¾ and ⅞ by ⅛ to ½..... 3 25

Round,

1 to 1¾ inch 2 85
2 to 2⅝ 3 15
2¾ to 3¼ 3 45
3¾ to 4 ..... 3 50
4¼ to 4½ 3 45
4¾ to 5 ..... 4 90

Square.

1 to 1¾ inch 2 85
2 to 2¾ 3 10
2¾ to 3¼ 3 45
3¾ to 4 ..... 4 00
¾ to ⅞ 3 00

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch. 3 10
1 to 1¾ by ¼ and 5-16 do 3 15
¾ to ⅞ by ¼ and 5-16 do 3 50
⅝ to ¾ by ¼ and 5-16 do 3 10

Half Oval and Half Round.

Wagon box iron ¾ and ⅞.. 4 80
1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1¾ to 6 by ⅛ to 3-16..... 3 50

Hoops.

1¾ to 2 , Nos 16 to 18..... 3 90
1¾ to 4 do 13 to 15..... 3 60
1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24..... 5 60
No 25 to 26..... 5 85
No 27..... 6 10
No 28..... 6 60

English Steel.

Best cast.....℔ lb 15½c
Extra cast..... 16¾c
Round machinery, cast 10c
Swaged, cast 18c
Best double shear 15½c
Blister, 1st quality.... 13c
Refined tool steel..... 16¾c
Spring calking ..... 7¼@7½c
German steel, best 11c
2d quality 10c
3d quality 9c
Sheet cast steel, 1st quality 15½c
2d quality 14½c
3d quality 12¾c

American Steel.

Best brands of refined cast steel..... 12c
Crucible machinery.... 8c
Open-hearth ditto..... 5c
Hammer cast steel 9½c
Spring cast steel..... 7½c
Bessemer and open-hearth spring..... 5½c
Ditto plow..... 5½c
Steel boiler plate ..... 6½@7c
Bessemer machinery...5 @6c
Spring and calking .... 7¼@7½c
Tire 5
Sleigh shoes..... 5

Bessemer Steel Tire.

¾ to 1 by 3-32..... 4½ ℔ lb
¾ to 1 by ½ to 5-32 ..... 4½ ℔ lb
¾ to 1 by 3-16 to ¼ ..... 4¾ ℔ lb

Miscellaneous Cast Steel.

Auger and auger bit..... 8
Axle steel for wagons..... 8
Frog points and plates..... 9
Frog size bars 7½
Pick, plain 10
Mattock, beveled..... 9
Table cutlery..... 8½
Trap spring steel..... 9
Pike and cant hook 8½
Coal and granite..... 8½

TINNER'S STOCK.

Tin Plate,

10x14 IC charcoal $6 25
do IX do 8 25
12x12 IC do 6 00
do IX do 8 50
14x20 IC do 6 50
do IX do ....$6 25@7 50
DC, 12½x17 do 6 00
DX 12½x17 do 8 00
For each additional X add 2 00
IC 10x14 } coke .....$5 75@5 50
IC 14x20 }
IC 12x12 do .....6 00@5 75

Tin.

Banca ..... per lb. 28c
Straits..... " 25c
English ..... " 25c
Spot Tin..... " 25c

Solder.

½ and ⅜.....16½c
Extra.....15½c
No. 1.....13½c

Pat Planished Sheet Iron.

{A} .....per lb 10½c
{B} 9½c

Nos	10 to 14	15 to 20	21 to 24	25 & 26
Com	3-60	3-80	4-00	4-20
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra

Zinc.

Sheet, cask..... 7¼@ 7¾
Sheet, open..... 8@ 8½

Tinners' Tools & Machines.

Machines (P. S. & W.) list add 20
Tools (P. S. & W.) .....add 6

LEAD.

American, ℔ lb.....5¼@5½c
Bar, ℔ lb..... 6½c net
Pipe, ℔ lb 7½c dis 10 per ct
Sheet, ℔ lb.. 8c dis 10 per ct
Tin-lined pipe ℔ lb 15c dis 10 pr ct
Shot Drop 7c; Buck.... 8c
Chilled Shot..... 8c

COPPER.

Lake Ingot..... 18¼c
Baltimore..... 17⅞@18c
Arizona..... 18c

Sheathing Braziers Copper, Bolts, &c.

Brazier's Copper, ordinary sizes, 16 oz. per sq. foot, and over per lb.....30c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 32c
Brazier's Copper, 10 oz. and 12 oz. per sq. ft...per lb. 34c
Brazier's Copper lighter than 10 oz. per sq. ft...per lb. 36c
Circles less than 84 inches in diameter .... per lb. 33c
Circles 84 inches in diameter and over .....per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb. 30c
Sheathing Copper, over 12 oz. per sq. ft.....per lb. 28c
Bolt Copper .....per lb. 30c
Copper Bottoms..per lb. 31@32c
No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x18 .....per sheet 6c
All other size sheets, 2¾c per square foot For tinning both sides, double the above amount.

SCRAP IRON AND OLD METAL

DEALER'S SELLING PRICES.

	Net Tons.
No. 1 wrought scrap.....	$24
Sheet and hoop "	10@11
Cast scrap, (No. 1 heavy).	19
Cast Scrap (Stove Plate).	12

OLD METALS.

Old copper per lb.....	15c
No. 1 H. Brass per lb.....	14
Heavy yellow Brass do.....	12
Light Brass per lb.....	12
Scrap Zinc per lb.....	6
Tea Lead per lb	3
Heavy Lead per lb	4

BRASS.

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Brass.

All Nos not thinner than to No. 28, wider than 2 in. not wider than 14 inch 30c
All Nos. to No. 28, inclusive, and widths over 14 to 20 in. inclusive 35c
All Nos. to No. 28, inclusive, and widths over 20 to 30 in. inclusive 38c
½c per lb. advance on each No. above Nos. 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at 53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches .37c

Low Brass.

4c per lb. more than High Brass.
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal
In Bars 48c
Sawed..... .51c
Planed or Polished...54c

For Slitting.

Metal in width in. to ¼ in. to No. 28, inclusive, 1c per lb advance.
Metal, in width 2 in. to 1 in., thinner than No. 28, 2c per lb. advance.
Metal, in width ⅛ in. to ¼ in. thinner than No. 28, 5c per lb. advance.
Metal ¼ in. in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths, add 7c per pound.

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe.

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛..	08		.40	.24
¼..	08	$0 11	.54	.42
⅜..	09	12	.67	.56
½..	11	15	.84	.85
¾..	13½	19	1.05	1.13
1 ..	19	28	1.31	1.67
1¼..	27	40	1.66	2.26
1½..	33	47	1.90	2.69
2 ..	46	64	2.37	3.66
2½..	75	1 00	2.87	5.77
3 ..	95	1 30	3.50	7.55
3½..	1 25	1 70	4 00	9.05
4 ..	1 50	2 05	4.50	10.73
4½..	1 75	2 40	5.00	12.49
5 ..	2 25	3 00	5.56	14.56
6 ..	2 75	4 00	6.62	18.76
7 ..	3 75	....	7.62	23.00
8 ..	4 75	....	8.62	28.00
9 ..	6 50	....	9.68	34.40
10 ..	8 00	....	10.75	40.64
12 ..	12 00	....		54.65

Discount, plain, 55 per cent; galvanized, 52½ per cent.

Gas and Steam Fitters' and Machinists' Supplies.

Gas and Steam Pipe—See Pipe Wrought.
Enameled Pipe .....dis 65
Artesian Well Casing....net list
Hydraulic Tubes.....net list
Malleable Iron Fittings..net list
Cast Iron Fittings .....dis. 55
Globe Valves.....dis. 50
Angle Valves.... .....dis. 45
Check Valves .....dis. 45
Safety Valves .....dis. 45
Eddy Gate Valves .....dis. 20
Steam Cocks ....dis. 45
Service Cocks .....dis. 45
Ball Gauge Cocks (net per dozen) $15
Compression Gauge Cocks dis. 45
Miss. Gauge Cocks .....dis. 45
Register Gauge Cocks (net per dozen) $15
Cylinder Cocks.....dis. 45
Air Cocks (net per dozen)...$2 75
Oil Cups.....dis. 45
Steam Gauges.....dis. 35
Water Gauges .....dis. 45
Scotch Glass Tubes .....dis. 60
Steam Whistles .....dis. 45
Iron Body Globe Valves..dis. 55
Iron Body Safety Valves..dis. 55
Iron Body Steam Cocks ..dis. 55
Pipe Tools .....special
Globe, Angle and Check Valves (Powell's regrinding).....dis. 45
Guarantee "Jet Pumps" dis 40
Mack's Injectors .....dis. 25

Babbitt Metal.

N. P. U. .....℔ lb @9c
A. 28c., B. 25c., C. 15c.

COAL,

WHOLESALE.

Wholesale f.o.b. vessel at Cleveland:

Carbon Hill and Monday Creek $2 65
Massillon ..... 2 75@ 2 85
Brier Hill..... 2 50@2 60
Pittsburgh 3 00
Salineville..... 2 25
Tuscarawas..... 2 50@3 50

RETAIL.—Delivered.

Massillon Lump.....$4 00
" Nut..... 3 75
Carbon Hill and Monday Creek, lump 3 75
Carbon Hill and Monday Creek, nut 3 50
75c less on cars by car load.
Anthracite Stove and Chestnut 7 15
Egg and grate 6 00

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15.....	7 50
11x14 to 15x24.....	8 50
16x24 to 20x28.....	9 75
15x34 to 24x30.....	10 75
26x28 to 24x36.....	11 50
26x36 to 26x44.....	13
26x46 to 30x50.....	14 00

DOUBLE THICKNESS

6x8 to 10x15.....	11 7
11x14 to 15x24.....	13 25
16x24 to 20x28.....	15 75
15x34 to 24x30.....	17 25
26x28 to 24x36.....	18 50
26x36 to 26x44.....	21 25
30x50.....	22 50
30x52 to 30x54.....	23 25
30x56 to 34x56.....	25 00
34x58 to 34x60.....	27 75
36x60 to 40x60.....	30 00

Dis 60 & 15 single, 60 & 20 double

OILS.

Pure Oils. packages included

Sperm, winter bleached per gal.....	1 18@1 20
Whale, winter bleached per gal.....	65@
Seal, winter bleached	80@ 85
Straits	50 @ 53
"A" oil for tanner's use	35 @ 40
Lard oil extra W S....	1 03
do No 1 do.....	85
do No 2 do.....	70
Tallow oil	65 @ 72
Neatsfoot oil pure....	1 05
do No 1	90
Linseed oil, raw	57
do do boiled.....	60
do do Extra Lake Erie	90
do do No 1.....	85
do do No 2	70
Cotton seed oil white..	64 @ 66
do do yellow	60 @ 63
Carbon oil Ohio legal test.....	9¼@11¼
West Virginia lubricating 28 deg.....	@ 29
Pure Mecca.....	55@ 50
Paraffine oil winter pressed.....	25@ 30
Machinery.....	40
Engine	50
Miners' oil.....	40@45
Drilling oil	40

Hides and Leather.

Prime cured hides,	7¾
Green hides	6@6¼
Bull, scrubby, badly scored or damaged, cured, two-thirds price.	
Prime dry hides.....	13@14
Horse hides, green	$1 75@2 00
Horse hides, dry.....	$2 00@2 25
Prime cured veal calf,	12½
Prime Deacon Skins, salted	65@7
Pelts, wool on ..	32@3
Fresh slaughter sheep	30@$1 5
Fresh slaughter lambs	50@6
Green calf skins.....	1
Hemlock rough.....	23@2
Oak harness	34@3
Oak sole	37@4
Union harness.....	31@3

Cleveland Business Directory.

Assayers and Analytical Chemists.

JUDSON, W, E, Ana ytical Chemist, 8 Cushing Block.

Bolt and Nut Works.

HOTCHKISS & GAYLORD, manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws.

Boiler Makers.

SMITH & TEACHOUT — (Established 1857.) Boiler, Tanks, Stills etc. 439 Broadway.

Bridge Builders.

BUCKEYE BRIDGE AND BOILER WORKS mfrs of Arch & Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St. and Case Ave.

Coal and Iron Exchange.

JACKSON IRON CO. Iron Ore and Pig Iron. Rooms 8 and 9. Fayette Brown, Gen. Agent.

RHODES & CO. Coal, Iron Ore an Pig Iron. Rooms 1 and 2.

Carriage Blacksmith.

STRIEBEL, CHAS. manfac'r. of Carriages and Wagons and platform trucks. Horse shoeing and general blacksmithing .93 Woodland ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts.

Church and School Furnture.

FAULHABER, GEO. manufacturer of School and Church Furniture. Fine Hard Wood work a specialty. 203 Ontario Street.

Custom Boots and Shoes.

ROONEY, JOHN manufacturer of hand-made Boots & Shoes, custom made and warranted 177 Ontario Street.

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection.

SLATER, G. A., Carriage dealer, sells the best work for the lowest price. A fine assortment always on hand. Repository 365 Euclid Avenue.

Coal and Pig Iron.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 122 Water Street.

Electrical,

ELECTRIC SUPPLY CO. manfrs and dealers in Electric Burglar Alarms, Anunciators, Cell Bells and Batteries. Telephone lines built and repaired. 145 Seneca Street.

Fresco Artists.

KEMMER & KUSHMAN DECORATIVE CO., Fresco Artists, Fine Modern Wall Papers. 338 Euclid ave.

Foundries.

BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

CLEVELAND MALLEABLE IRON CO., manufacturers Malleable Iron Castins.

LAKE SHORE FOUNDRY, Water and Gas Pipe, Light and Heavy Castings. Alabama st.

TAYLOR & BOGGIS, successors to H. & H. F. Taylor, Iron Founders, 65 to 73 Central Way.

VIADUCT FOUNDRY COM'Y, Aenis, Carlin & Strangward manfrs of Machinery Castings Fine Light Castings a Specialty. Office & Works 11 13 15 and 17 Detroit Strert, near Center.

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway.

File and Saw Works.

PARKIN, W. H. & CO., Hand-cut Files and Rasps, dealers in Disston's saws, 11 So. Water

Flue Cleaner.

CLEVELAND FLUE CLEANER M'F'G. CO. manufacturer of Aitchison & Doolittle's Patent Steam Flue Cleaner, 22 & 24 Power Block.

Hotels.

FOREST CITY HOUSE, cor. Public Square and Superior st., Terrill & Ingersoll, Props.

KENNARD HOUSE, D. McClasky, Prop.

NEW ENGLAND HOTEL, Water st., W. W. Wolcott, Prop. Refitted and refurnished.

STRIEBINGER HOUSE, between Ontario and Seneca sts. $2.00 per day. Hawley & Langton

CITY HOTEL, Seneca street. H. B. West, proprietor. $1.50 per day.

Hides, Pelts and Leather.

DENNISON BROS., dealers in Hides, Pelts, Furs and Tallow, 48 and 50 River street.

Hardwood Lumber.

MARTIN, J. T. dealer in Hardwood Lumber, Stone's Levee, near Central Way.

Lumber.

WOODS, PERRY & CO., manufacturers and dealers in Lumber, Lath, etc., 5 Carter st.

FISHER, WILSON & CO., wholesale lumber dealers (pine & hard wood), rough and dressed umber, timber, lath, shingles, etc. 47 Central Way

KRAUSE, C. A., & SON, wholesale and retail dealers in lumber. Yards cor. Superior and Wason and 281 Merwin streets.

Cleveland Business Directory.

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water street.

CLEVELAND ROLLING MILL CO., manuf'rs. of Steel and Iron Wire and Steel Tire.

WORTHINGTON, GEO. & CO., Hardware and Dealers in Metals. Water street.

Lime Manufacturers.

RUSSELL LIME CO., manufacturers of White Lime; also dealers in Plaster, Cement, etc. 85 Elm street.

Machinery and Boilers.

CLEVELAND STEAM FURNACE CO., Engines and Boilers, cor. Detroit and Center sts.

KRITCH, K. E. Metal Pattern Maker. Small machinery repaired. Lawn Mower sharpening a specialty. 42 South Water Street.

Machinery Depot.

CLEVELAND MACHINERY DEPOT, (now National Machinery Depot.) The largest stock of New and Second-hand Engines, Boilers and Machinists' Tools. Shop and Warehouse corner Bond and Superior streets.

Mercantile Agency.

THE MERCANTILE AGENCY. R. G. Dun & Co. proprietors. 121 Superior street.

Oil Manufacturers.

AMERICAN LUBRICATING OIL CO., manufacturers of lubricating oils, 23 Euclid ave.

Paints and Oils.

MASTERS, J. N. jobber in Paints, Oils, Varnishes. Brushes, 34 Prospect st.

Pattern and Model Makers.

WHITTINGHAM, J. & C., Metal Pattern and Model makers 52 Canal Street.

STAIR BUILDER.

PFEIL, CHAS, Stair Builder; Hard Wood Mantles and Office Railing. Works, 49 & 51 Canal street, Cleveland, Ohio.

JOHNSON & PURSER, Stair Builders, and manuf'rs of Mantels, Odd Pieces of Furniture, &c. 30 West street, up stairs.

Steel Stamps and Stencils.

FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils. 197 Superior street.

Tanners.

GAENSSLEN BROS., Tanners, and dealers in leather, oil and shoe findings. 80 Water-st.

Trunks and Valices.

FABER, J. manuf. Trunk, Traveling Bags and Ladies' Fine Satchels. Sample Trunks and Cases a Specialty. 56 Public Square.

Vessel Agents.

WEBB, H. J. & CO., Ship Brokers and Vessel agents. 17 & 18 Board of Trade Building. 122 Water Street.

Wood Carving.

HERKOMMER, J., Carver and Ornamenter in Composition. 225 Erie street.

Business Directory.

Akron, O.

AKRON IRON CO., manufacture best Common, Refined and Charcoal Iron.

CASCADE HOUSE, cor. Mill and Summit sts., near Depot. J. Downie, Prop.

MCNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

PERKINS, C. E., dealer in Agricultural Implements, machinery, and Manufacturers' Ag'nt

TAPLIN, RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc.

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street.

Alliance, O.

ARLINGTON HOUSE, cor. Main and Liberty Streets. Centrally located. Sample Room for Commercial Travellers. H. S. Adams, proprietor

MCFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing.

Cuyahoga Falls, O.

THOMAS BROTHERS, manfrs of Ohio Stone Ware. Cuyahoga Falls Stone Ware Factory, cor. Main and Broad streets,

TURNER, VAUGHN & TAYLOR, manufacture engines, presses and grinding machinery for clay; also paper, chain, wire and flour mill machinery. Send for Circulars and price list.

SNYDER, H. wholesale manu acturer of Sash, Doors, Blinds, &c. Send for Price Lists.

THE CUYAHOGA FORGE AND IRON CO., manfrs. of every description Car, Truck and Driving Axles, Forging, Shafting. &c.

Canal Dover, O.

HECKMAN, E., manufr. and dealer in harness leather, upper, kipp and calf. Also, manufacturer & dealer in prime English Dairy cheese. Highest market cash price paid for hides.

Business Directory.

Columbus, O.

PAT. ADJUSTABLE WINDOW CURTAIN Cornice, manufactured by Strader's Curtain Cornice Works.

ROYCE & PULLING manufrs of Patent Steam Pumps for all purposes. Store room 30 High street. Works Nos. 5 and 7 Scioto street.

U. S. CARRIAGE CO. builders of fine Carriages, Buggies and Phætons. Salesrooms and Office 257, 259 and 261 Fourth street.

REYNOLDS BROS., manufacturers of hand-cut Files and Rasps. Old files re-cut. Send for Price List.

CITY BOILER WORKS, manfrs of Stationary, Portable and Locomotive Steam Boilers. All work warranted. Borger Bros. & Co.

MURRAY, HAYDEN & CO., manfrs of Malleable Iron. Cor. Randolph & West streets.

Canton, O.

DIEBOLD SAFE & LOCK CO., manuf'rs. Safes, Locks, Bank and Safe Deposit Works.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc

NEW AMERICAN HOUSE, Canton. Fred. Hipp, Prop.

EBERSOLE & KAILEY, Machine and Jobbing Shops. Gearing for Patterns or Machinery a specialty. Models of all kinds made & repaired.

Geneva, O.

THE ENTERPRISE MACHINE CO., L. L. Crane, Pres't, manfrs of Machinists' Tools and Machinery. Gear Cutting a specialty.

Lima, O.

LIMA HOUSE, centrally located; telegraph office in the house. J. Goldsmith, Prop.

Massillon, O.

CITY CARRIAGE WORKS, P. H. Young, prop. manfact'r of Carriages, Phætons and Spring Wagons. Work warranted. Cor. Tremont & Erie.

Painesville, O.

NORTH AMERICAN CUTLERY CO., m'fr's of Steel Shears and Scissors—best quality.

Ravenna, O.

THOMPSON, T. F., dealer in Agricultural Implements, farm machinery, hardware, seeds, fertilizers, &c. Cor. Main and Prospect sts.

BALDWIN, D. L. & SON, Contractors & Builders and manfrs of all kinds of Moulding, flooring, siding, &c. Rip, Band and Scroll Sawing.

Steubenville, O.

DORRANCE, D. W., Tool Works, manufacturer of hand-made miners' and stone-cutters' Tools Promp attention given to mail orders.

Sandusky, O.

SANDUSKY WHEEL CO. manfrs. of Sarven Patent Wheels, Carriage Bodies and Seats, Plain Wood Hub Wheels, Banded Hub Wheels, Jacobs' Patent Neck Yokes.

Toledo, O.

BAKER, HERBERT, Machine Shop and Iron Foundry. 98 and 100 Erie street.

TOLEDO FOUNDRY AND MACHINE CO. builders of Steam Engines, Circular Saw Mills and all kinds machinery. Water St., cor. Cherry

RUSSELL IRON WORKS, mnfrs. of Architectural Iron Work, castings, pulleys, shafting and steam bending machinery. Cor. Water and Lagrange streets.

STANDARD SAW WORKS, H. Bartley, manufacturer and dealer in Saws of every description. All kinds of Springs made from Sheet Steel. Reaper, Hay Knives Truss Springs, &c. made to order. 92 St. Clair Street.

UNION Wooden Ware Manufacturing Co. manufacture Sewing-machines, washboards, children's wagons, carts, wheelbarrows, sleds, kitchen wooden ware, &c.

HEPBURN BROTHERS, proprie. Union Boat Works. Boats of all kinds made to order. For sale or rent. Water Street foot of Cherry.

Youngstown, O.

BELL, EDWIN & SON, manuf. of Nail Kegs, Pat. coiled hoops, slack barrel and keg heading and oil barrel stock.

DINGLEDY, G. H. dealer in rough and dressed Lumber, Shingles and Lath.

MORTON HOUSE, formerly Maitland House, James Morton, Prop.

TOD HOUSE, cor. Diamond and Market streets. Henkel & Bowman, Props.

Zanesville, O.

KIRK HOUSE, William Kirk, proprietor. $1.50 per day.

Rochester, Pa,

OLIVE STOVE WORKS, (limited) manufacturers of Stoves and Hollow Ware.

Erie, Pa.

ERIE STEAM BENDING WORKS. H. G. Fink, prop'r, manufacturer of Bent Felloes, poles, snafts, bob runners, etc. Cor. 12th & Cherry.

GUNNISON, A. B., wholesale manufacturer of Wood Pumps. 233 East Twenty-Second St.

BALL ENGINE CO., limited, manufacturers of Automatic Engines of 15 to 80 horse power

NOBLE SEWING MACHINE CO. manfrs of the New Noble Sewing Machine. Send for circulars and prices.

A. B. FELGEMAKER & CO. Church Organ builders. Descriptive catalogue furnished on application.

Business Directory.

Titusville, Pa.

FOSTER & MCKAY, dealers in boilers and engines, tubing, casing, old iron, rope, and all kinds of metals. Washington street, nr. Railroad.

Meadville, Pa.

CURRY & CO. general Jobbers in Castings of al kinds.

Oil City, Pa.

REID, JOS. Machinist, steam engine and pump repairing. Brass and iron castings, light and heavy, made on short notice.

Sandy Lake, Pa.

EBERMANN, W. S. & SONS, manfrs. of the celebrated Ebermann Boiler Feeder. Send for Circulars and Price List.

Pittsburgh, Pa.

PRINTING PRESSES. W. A. Bunting, manufacturers' agent. Printers supplies, type, cards. 42½ Sixth Street. [Up stairs.]

BAIR & GAZZAM, practical machinists; gear cutting a specialty. Rice's Feed Water and Heater. 17 Wood street, corner First Avenue.

Wheeling, W. Va.

EXCELSIOR MACHINE WORKS, Redman & Co., general machinists and manufacturers of Marine and Stationary Engines, Hangers, Pulties, Shafting, &c. Cor. 18th & Chapline streets.

Louisville, Ky,

HAIGHT, ROBERT, Gold, Silver and Nickel Plating and Brass Finishing Shop. Car Trimmings and Steamboat work a specialty. 1 West Market street

Union City, Ind.

LAMBERT, J. W. & CO., mfrs of fork, rake, hoe and broom handles; spokes, hubs, whiffletrees, yokes, plow-rounds, &c. Correspondence solicited.

Olean, N. Y.

MYRICK BROS. & CO., manufact'rs Engines and Boilers, oil drilling tools, rig irons, etc.

Rochester, N. Y.

GOWE, JNO. N., mfrs. of Specialties, such as Machine forging, bridge bolts and trusses, railroad switches, spike, mall, chisels, &c.

ELEVATORS for Hotels, Factories and Private Houses. J. S. GRAHAM & CO.

KELLY, PETER, Boiler Maker, Mill street, cor. Furnace. Sheet iron work made to order

WOOD-WORKING MACHINERY. Send for Catalogue. J. S. GRAHAM & CO.

KINGSBURY, G. J., Cracker and Oven Machinery Works. Shawmut Building, Mill St,

WISEMAN, Albine, manufacturer of all kinds of Shoemakers' Tools. 117 North Water St.

ULSCHT & LINN mfrs of Wood Lathes, Engraving Machinery, &c 131 N. Water street

RAZOR STROPS. Sole mfrs. of all kinds of Razor Strops. Ulscht, Linn & Co. 131 N. Water

Buffalo, N. Y.

SANDS, PAUL, Marine and Stationary Steam Engine Works mfr. of drilling machines, foot and power lathes. 70 Columbia street.

EMPIRE STATE MF'G CO., O. F. Swift, prop'r, manfr of Fluters, Sad Irons, Spun Copper & Half Copper Tea Kettles. Washington, cor. Ohio

WHITE, L. & I, J. manfrs of Coopers' Tools, Carpenters Tools, Draw Shaves, Cleavers Choppers, Ship Tools, &c. 312 Exchange street.

THE BUFFALO NUT AND BOLT CO. [Limited.] Manufrs. of Hot Pressed Nuts, Bolts, Washers, Rivets, &c. No. 226 Ohio Street.

Rheims, N. Y.

GREAT WESTERN CHAMPAGNE. Finest made in America. Equal to best imported. Has taken highest awards everywhere, and is used all over the Continent. Try a case, and you will have no other. Pleasant Valley Wine Co., Rheims, N. Y.

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A JOY FOREVER!

ESTEY ORGANS

Manufactured by

J. ESTEY & CO.,

Brattleboro', Vt.

(Catalogue free on application.)

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Engraver on Wood
Cor Circle & Market Sts.
JOURNAL BUILDING, INDIANAPOLIS, IND.

CLEVELAND
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FOUNDRY
55 FRANKFORT STREET 55
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Smith & Curtiss,

JOBBERS OF

TEAS,

COFFEES AND SPICES

ALSO PROPRIETORS OF THE

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Coffee and Spice Mills,

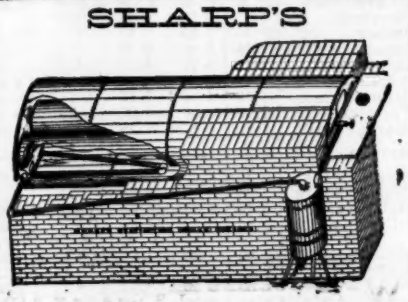
107 & 109 Bank Street,

Cleveland, O.

JUDSON'S PATENTED
SECTIONAL
Assay Furnaces
AND APPLIANCES.

Model Furnace for 1881,
All steel, light and durable, with Revolving Grate, etc. Also
Judson's Practical Stoking Attachment
Guaranteed to feed coal, coke or charcoal without choking the draft.
Manufactured only by the patentee,
W. E. JUDSON,
Cleveland, O

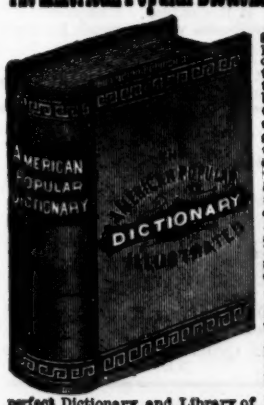
SHARP'S



SELF-ACTING BOILER CLEANER.

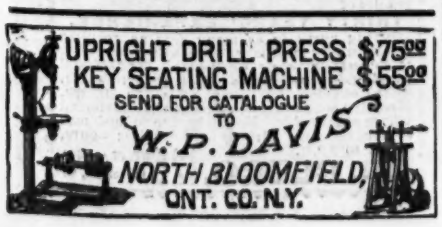
Patented November 23, 1880.
THOS. SHARP & CO.
SALEM, OHIO.
☞ Send for Circular and Price List.
[Mention this paper.]

The American Popular Dictionary, $1 Only.



This useful and elegant volume is a complete Library and Encyclopedia, as well as the best Dictionary in the world—superbly bound in Cloth and Gilt. *It contains every word of the English language, with its true meaning, derivation, spelling and pronunciation,* and a vast amount of *absolutely necessary information upon Science, Mythology, Biography, American History, Law, etc.*, being a perfect LIBRARY OF REFERENCE. Webster's Dictionary costs $6.00, and the American Popular Dictionary costs only $1.00. "Worth ten times the money."—*N. Y. Times.* "We have never seen its equal, either in price, finish or contents."—*Chris. Advocate.* "A perfect Dictionary and Library of Reference."—*Leslie's Illus. News, N. Y.* One copy of the American Popular Dictionary (Illustrated), the greatest and best book ever published, postpaid, to any address on receipt of only $1. ☞ Entire satisfaction guaranteed. Two copies postpaid for $2. A GRAND HOLIDAY PRESENT. *Order at once.* This offer good for 60 days only *and may never appear again.* 2,000 copies sold in two months! Agents Wanted. H. C. DEAN, Pub'r, 80 Metropolitan Block, Chicago, Ill.

Our readers will find this wonderful book the cheapest Dictionary published. The information it contains is worth many times the amount asked for it, and it should be in the possession of every body. With this book in the library for reference, many other much more expensive works can be dispensed with, and ignorance of his country, history, business, laws, etc., is inexcusable in any man. Note price, $1, post-paid.



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Dover Fire Brick Co.,

MANUFACTURERS OF

Fire Brick of all Shapes and Sizes,

— AND —

Shippers of Fine Ground Fire Clay.

Office--101½ Water Street, Cleveland.

Truck Hubs.

Black Birch Carriage, Wagon and
TRUCK HUBS.
Sizes from 3½x6½ to 18x22.
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OLEAN, Cattaragus Co., N. Y.

Practical Lithographer.

CHAS. F. SCHMIDT,
PRACTICAL
Lithographer, Engraver
AND PRINTER,
Room 12 Bratenahl's Block, cor. Superior and South Water Streets, Cleveland, O.
Correspondence solicited from Manufacturers.

Patent Steel Tube and Flue Brush.
Best in the Market.
Made any size required.
Combines the properties of a Scraper and Brush.
Full stock always on hand.
L. B. Flanders Machine Works
1025 Hamilton street,
PHILADELPHIA, PA.

JOSEPH M. DOWNING.

UNION TUBE WORKS, NEWCASTLE, PA.

MANUFACTURER OF

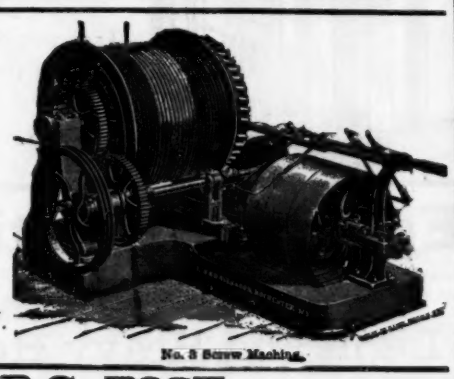
LAP WELDED BOILER TUBES

FROM BEST AMERICAN

Charcoal Hammered Iron.

Freight and Passenger

Elevators.



No. 3 Screw Machine.

L. S. GRAVES & SON,
Cor. Center and Frank Streets,
ROCHESTER, N. Y.

Send for our Catalogue.

EDWARD C. POST,
Successor to Smith & Post,
Manufacturer of
Hydraulic and Steam Power Passenger and Freight

ELEVATORS,

HAND ELEVATORS, Etc., Etc.

Shafting, Pulleys and Hangers, Etc.

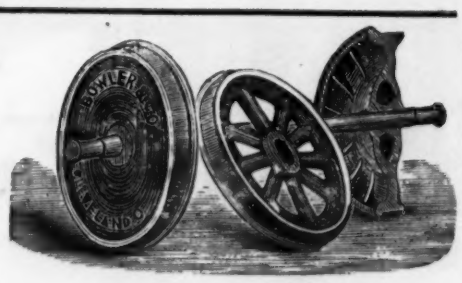
Send for Circulars and Price List.
CORNER ST. CLAIR & WASHINGTON STREETS,
TOLEDO, OHIO.

Cleveland Foundry.

CASTINGS
For Machinery and Rolling Mills.

Car Wheels
all sizes and kinds, with and without Axles.

Chilled Faced R. R. Frogs.
STREET RAILROAD TURNOUT
Nos. 9, 11, and 13 Winter Street.
BOWLER & CO.



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Gold, Silver & Nickel Platers

109 Ontario Street.
CLEVELAND, O.

B. F. Roberts,

BOILER MAKER,

And Sheet Iron Worker.
BRIDGE STREET, SPRINGFIELD, OHIO
Special attention paid to taking out and Piecing Portable Flues.
☞ Orders by mail to B. F. Roberts, Springfield, Ohio, promptly attended to.

E. F. ENSIGN,
JOBBER OF

Agricultural Implements,

WAGONS, FERTILIZERS, SEEDS, &C.
The Empire Grain and Fertilizer Drill and Twine Binding Harvesters Specialties.
134 ST CLAIR STREET, CLEVELAND, O

Springfield Brass Foundry.
Pattern and Model Work a Specialty.
Castings done in White Metal, Brass, Zinc, Type Metal, Pig Lead, Pig Tin, Bar Lead, Bar Tin, Antimony, Copper, Spelter, &c., &c.
Cash paid for Old Brass and Copper
McLAUGHLIN & SHILLING.
68 South Limestone Street,
SPRINGFIELD, O.

PURE PREMIUM BONE.

The tried and never failing Fertilizer in all grains and grass crops. It has proved its value as such by years of actual use all over the world. Circulars and Price List free. Address all letters pertaining to the purchase of Premium Bone, or the sale of bones, to **Excelsior Fertilizer Works,** Salem, Columbiana County Ohio.

TRAVELERS' REGISTER.

Lake Shore & Michigan Southern.

Trains marked with a * are the only trains that arrive and depart in this city on Sundays.

EAST BOUND TRAINS.

	Arrive.	Depart.
No. 20 Limited Express	*1:35 A.M	*1.50 A.M
No. 6 Atlantic Express	*7:05	*7.30
No. 10 Buffalo Accom.	11:00	11.15
No. 8 C. & St. L. Exp.	*2:25 P.M	*2.55 P.M
No. 4 Special N. Y. Exp.	10:10	10.35
No. 2 San. Div. Accom.	10:12	
No. 12 Conneaut Accom.		4.50
Nottingham Accommodation (Sundays only)	10.05 A.M / 4.45 P.M	9.00 A.M / 2.15 P.M
No. 18 Elyria Accom.	8.50 A.M	

WEST BOUND TRAINS.

	Arrive.	Depart.
No. 13 Mich. Accom.		6.40 A.M
No. 1 Special Chicago Ex.	*6.35 A.M	7.00
No. 3 Toledo Express	1.25 P.M	3.30 P.M
No. 21 St. Louis Express	*1.40	*2.05
No. 5 Pacific Express	*7.05	*7.35
No. 11 Conneaut Accom.	8.40 A.M	
No. 19 Pt. Clinton Accom.		5.00
No. 7 Michigan Exp.	*2.50 A.M	*3.05 A.M
No. 17 N.Y. & Chi. Ex.	11.43 P.M	11.53 P.M

Cleveland, Columbus, Cincinnati & Indianapolis.

ARRIVALS.

No. 2 Col. & Cin. & Ind'pons Ex.	*7 10 A.M
No. 8 C. T.V. & W. & Clev. Accom.	10 30
No. 12 St. Louis & New York Exp.	*3 00 P.M
No. 4 Special Cin. & New York Exp.	*3 40
No. 10 Wheeling & Cleveland Exp	8 30
No. 6 Indianapolis & Columbus Exp.	10 20

DEPARTURES.

No. 1 Cincinnati & Columbus Exp.	8 00 A.M
No. 11 Cleve, Indianap. & Wheel'g Ex.	7 10
No. 8 St. Louis & Cincinnati Ex.	†2 00 P.M
No. 5 Night Express,	*7 25
No. 7 C.T.V. & W. & Col. Accom	4 00

†This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland, Tuscarawas Valley & Wheeling.

ARRIVALS.

No. 4 Wheeling & Cleve'd Exp.	7 15 P.M
No. 2 Uhrichsville Accom.	10 30 A.M

DEPARTURES.

No. 1 Wheeling & Cleve'd Exp.	7 10 A.M
No. 3 Uhrichsville Accom.	4 00 P.M

New York, Pennsylvania & Ohio.

ARRIVALS.

No. 7 Mahoning Valley Accommo.	10 55 A.M
No. 3 New York Express,	*7 00 P.M
No. 1 New York Express,	6 50 A.M
No. 3 Pittsburgh Express,	*7 00 P.M
No. 5 Pittsburgh Express,	3 10
New York Express	3 10
No. 9 Youngstown and Pitts. Local	10 15

DEPARTURES.

No. 12 New York Express,	*7 10 A.M
No. 4 Youngstown Local,	11 15
No. 8 Mahoning Accommodation,	4 25 P.M
No. 2 New York Express,	10 45
No. 12 Pittsburgh Express,	*7 10 A.M
No. 6 Pittsburgh & Main Line Express.	2 30 P.M

Cleveland & Pittsburgh.

	DEPARTURES.	ARRIVE.
Mail	8 50 A.M	1 45 P.M
Express	2 30 P.M	6 55
Alliance Accommodation	3 45	10 15 A.M
Ravenna Accommodation	5 35	8 35
Night Express	†11 40 P.M	6 30 A.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance.

Valley Railway.

ARRIVE.	DEPARTURES.
No. 2 Accom... 10 15 A.M	No. 1 Mail ... 8 15 A.M
No. 6 Express... 1 35 P.M	No. 3 Accom. 2 20 P.M
No. 4 Mail ....6 30 P.M	No. 5 Exp.....6 05

Trains leave from Depot foot of South Water Street.

Special trains leave on Sunday at 8.30 A. M. and 4.20 P. M., arriving at Cleveland at 10 A. M. and 6.25 P. M.

Connotton Valley Railway.

Arrive.	Depart.
No. 1 .....10 05 A.M	No. 4.....4 00 P.M
No. 3..... 7 15 P.M	No. 2.....8 10 A.M

All trains arrive and leave depot corner Commercial and Fifth Streets

Greatest Rock Breaker ON EARTH.

CAPACITY { A TON A MINUTE. Don't Forget It!

Guaranteed to do Double the Work of any other or Money Refunded.

Send for Circulars.

ALSO

ENGINES, BOILERS, STAMP MILLS, AND MINING MACHINERY.

GATES & SCOVILLE IRON WORKS.

52 Canal-St., Chicago.

IMPROVED

Hoisting Engines,

Manufactured by the

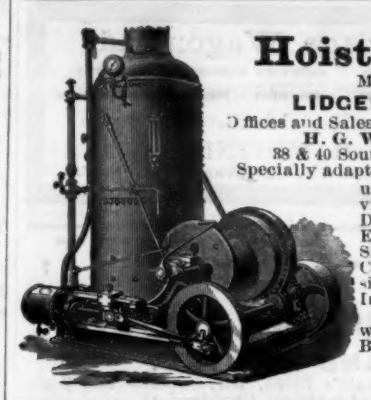
LIDGERWOOD M'F'G CO.

Offices and Sales Rooms, 96 Liberty St., New York

H. G. WORMER & CO, Agents,

38 & 40 South Canal Street, Chicago, Ill.

Specially adapted for Railroads and Contractors uses, Pile Driving, Bridge & Dock Building, Excavating, etc Single ordouble Cylinders, with single or double Improved Friction Drums, with or without Boilers.



IRON ROOFING.

MOSER & THOMPSON,

MANUFACTURERS

Corrugated Iron Siding for Grain Elevators a Specialty.

Iron Ore Paints.

29, 31 & 33 River Street,

CLEVELAND, OHIO.

Send for Circular and Price List, mentioning this paper.

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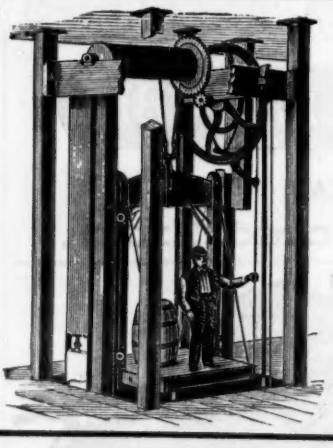


The Middlebrook Elevator Manuf'g Co.

BUILDERS EXCLUSIVELY OF

Elevators & Hoisting Machinery,

Hydraulic,

Steam and Hand Power, for Passenger and Freight.

Manufacturers' Agents for the

OTTO SILENT GAS ENGINE,

From 1 to 25 horse power.

ALSO THE RIDER HOT AIR PUMPING ENGINE,

And Clark's Noiseless Rubber Wheels.

All kinds of Trucks made to order.

Factory, 175 West Larned-st.,—Office, 64 Griswold-st., DETROIT, MICH.

Engines, Hoisting Machines

And General Machinery.

EXTRA HEAVY STEAM ENGINES and other machinery adapted for Rolling Mills, Forges, Mines, &c., specially designed to suit local requirements.

Light and Heavy Hoisting Machinery

of every description, adapted for either slow or rapid hoisting, and with or without Friction Clutches or Steam boilers, &c. I am now prepared to manufacture my recently designed

FRICTION BAND HOIST,

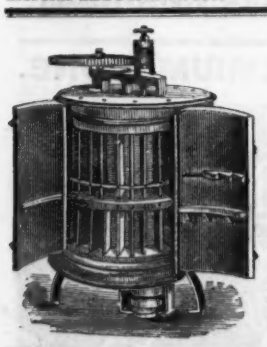
Specially designed for rapid hoisting, which for cheapness, simplicity, driving capacity, ease and reliability of operation will be found superior to any other hoisting machine in the market. Patterns changed or new patterns made in any case to suit local requirements.

To parties wishing to build newly designed machinery I give especial attention.

Designs and estimates for machinery, as a base for negotiations, forwarded on application. Promptitude guaranteed. Correspondence solicited.

W. H. THOMPSON,

Phoenix Iron Works, Wason Street, Cleveland, Ohio.



Geo. Oliver,

Manufacturer of the

IMPROVED UNITED STATES

BRAN DUSTER,

Mill street corner Brown

Rochester, N.

Bran Dusters, Brushes and Wire Cloth furnished to order at Lowest Prices.

EDWARDS, TOWNSEND & CO.

WHOLESALE GROCERS,

And dealers in

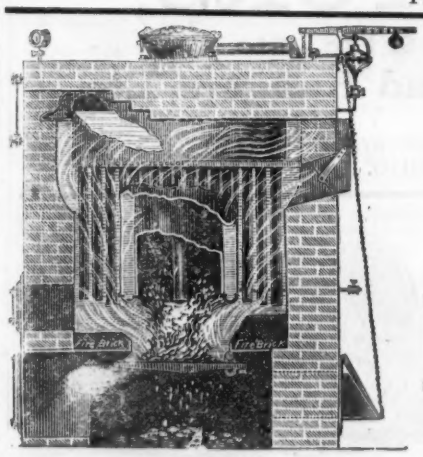
Wines, Liquors and Cigars,

Teas a Specialty.

Nos. 151 & 153 WATER STREET

CLEVELAND, O.

NATIONAL BOLT & PIPE MACHINERY CO
CUTTERS OF HAND & POWER BOLT & PIPE CUTTERS, BOLT POINTERS, BOLT HEADERS, HOT & COLD PRESSED NUT MACHINERY, TAPS & DIES, &C. SEND FOR CIR. CLEVELAND, O.



J. C. McNEIL

PROPRIETOR OF

Akron Boiler Works,

Manufacturer of

BOILERS OF ALL KINDS.

Also Heavy Sheet and Boiler Iron Work.

SPECIALTIES:

Rotary, Globe Bleach Boilers, and McNeil's Patent Magazine Heating Boilers.

Repairing Promptly Attended To

Shop 503 South Broadway, Opposite Buckeye Works.

AKRON, O.

Blue Grass Route of Ohio

TIME TABLE.

The Cleveland, Mt. Vernon and Delaware RAILROAD.

GEO. D. WALKER, RECEIVER.

Schedule No. 5--Dating from Sunday, June 4.

SOUTH-BOUND TRAINS.

STATIONS.	Accom	Accom	Expr	Mail	Sunday only
Leave.	P.M.	P.M.	P.M.	A.M.	P.M.
Cleveland	5.30	3.45	2.30	8.50	.....
Hudson	6 53	5.02	3.35	10.10	4 20
Cuyahoga Falls	7.11	5.30	3.53	10.29	4 40
Akron	7.23	5.46	4.10	10.42	5 00
*North Portage	P.M.	6.00	4 24	10.54*	6 14
Clinton	.....	6 19	4.44	11.09	5 31
Warwick	.....	6 29	4.49	11.14	5 37
*Marshallville	.....	6 43	5.02	11.27*	5 50
Orrville	.....	6 58	5.14	11.42	6 06
*Apple Creek	.....	7.17	5.32	11.58*	6 22
Fredricksburg	.....	7.32	5.45	12.11	6 37
*Holmesville	Accom	7.43	5.55	12.21*	6 48
Millersburg	7.55	6.08	12.34	7 00	
	A.M.	P.M.			A.M.
Millersburg	5.50	.....	6.08	12.34	7 00
*Killbuck	6.02	.....	6.20	12.47*	7 13
*Black Creek	6.18	.....	6.31	12.59*	7 25
Gann	6.33 b / 6.53	.....	6.51 / 7.11 s	1.19	7 47
Danville	7.04	.....	7.20	1.29	7 59
Howard	7.13	.....	7.29	1.38	8 10
Gambier	7.22	.....	7.38	1.47	8 20
Mt. Vernon	7.35	.....	7.51	2.00	8 33
*Bangs	7.45	.....	8.01	2.1*	8 45
*Mt. Liberty	7.53	.....	8.09	2.20*	8 54
Centerburg	8.05	.....	8.18	2.30	9 05
*Condit	8.19	.....	8.32	2.44*	9 19
*Sunbury	8.27	.....	8.40	2.53*	9 28
*Galena	8.32	.....	8.45	2.58*	9 34
Westerville	8.48	.....	9.00	3 15	9 50
Arrive at Columbus	9.15	.....	9.25	3.40	10 20
	A.M.		P.M.	P.M.	A.M.

NORTH-BOUND TRAINS.

STATIONS.	Expr	Mail	Accom	Accom	Sundays only
Arrive at	P.M	P.M.	A.M.	A.M.	A.M.
Cleveland	1.45	6.55	10.15	8.30	.....
Hudson	12.35	5.48	8.53	7.15	10.30
Cuyahoga Falls	12.16	5.30	8.33	6.58	10.11
Akron	12.03	5.17	8.20	6.45	9.50
*North Portage	11.46	5.00*	8.03	A.M.	9.34
Clinton	11.30	4.44	7.46	.....	9.18
Warwick	11.25	4.37	7.37	.....	9.12
*Marshallville	11.10	4.27*	7.23	.....	9.00
Orrville	10.57	4.14	7.10 b / 6.40	.....	8.47
*Apple Creek	10.40	3.58*	6.22	.....	8.27
Fredricksburg	10.26	3.43	6.08	.....	8.13
*Holmesville	10.16	3.33*	5.58	Accom	8.02
Millersburg	10.05	3.22	5.45	Accom	7.50
			A.M.	P.M.	P.M.
Millersburg	10.05	3.22	.....	8.35	7.25
*Killbuck	9.51	3.08*	.....	8.23	7.13
*Black Creek	9.39	2.57*	.....	8.11	7.00
Gann	9.17	2.36	.....	7.49	6.38
Danville	9.07	2.27	.....	7.39	6.25
Howard	8.58	2.18	.....	7.29	6.14
Gambier	8.49	2.09	.....	7.14	6.03
Mt. Vernon	8.37	1.57	.....	7.02	5.51
*Bangs	8.22	1.40*	.....	6.46*	5.37
*Mt. Liberty	8.14	1.31*	.....	6.37	5.28
Centerburg	8.05	1.22	.....	6.28	5.17
*Condit	7.51	1.09*	.....	6.14	5.03
*Sunbury	7.42	1.01*	.....	6.06	4.53
*Galena	7.37	12 56*	.....	6.00	4.47
Westerville	7.20	12.40	.....	5.43	4.30
Leave Columbus	6.55	12.15	.....	5.15	4.00
	A.M.	P.M		P.M.	P.M.

* Stop on signal. B Breakfast. S Supper.

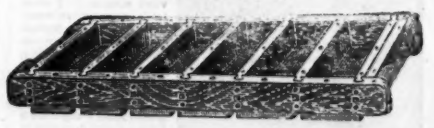
Special Round trip rates will be made for Sunday trains.

N. MONSARRAT, Gen'l Supt. Akron, O

E. T. AFFLECK, General Passenger Ag't, Columbus, O.

D. J. C. ARNOLD,

Manufacturer of



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Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

7:10A.M. LIGHTNING EXPRESS, (daily,) sleeping and hotel coaches from Leavittsburg, 8:55 a.m. To New York, Albany and Boston without change. Parlor car, Cleveland to Salamanca. Arrives at Meadville 11:20 a.m., (dinner); Franklin, 12:33 p.m.; Oil City, 1:00 p.m.; Corry, 1:00 p.m.; Jamestown, (Lake Chatauqua) 1:57 p.m.; Buffalo, 6:15 p.m.; Rochester, 8:30 p.m.; Hornellsville, 6:40 p.m., (supper); Corning, 8:25 p.m.; Elmira, 8:57 p.m.; Binghampton, 10:58 p.m.; Albany, 6:00 a.m.; Boston, 2:45 p.m.; arriving at New York, 6:50 a.m.

10:45 P.M. NIGHT EXPRESS, (daily ex cept Sunday), Sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown 1:45 a.m.; Meadville, 3:50 a.m.; Corry, 5:20 a.m.; Jamestown, 6:22 a.m.; Buffalo, 9:45 a.m.; Rochester, 1:10 p.m.; Hornellsville, 11:20 a.m.; Corning, 12:53 p.m.; Elmira, 1:21 p.m.; Binghampton, 2:50 p.m.; New York, 9:25 p.m.

2:30 P.M. PITTSBURGH EXPRESS,—daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:25 p.m.; Washington, 7:30 a.m.; Baltimore, 8:15 a.m; via Sharon and Sharpsville to Meadville 7:40 p.m.

4:25 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 7:30 p.m; Sharon, 8:30 p.m; Sharpsville 8:40 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m.

7:10 A.M. PITTSBURGH EXPRESS,—(daily) through without change. Arrives at Youngstown, 10:00 a.m.; Sharon, 10:55 a.m.; Sharpsville, 11:05 a.m.; Pittsburgh, 1:08 p.m. Returning, leave Pittsburgh, 4:48 a.m., 8:55 a.m., and 1:18 p.m. and 4:20 p.m.

11:15 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 2:10 p.m.; Pittsburgh, 6:10 p.m. Trains arrive at Cleveland, 6:50 a.m., 10:55 a.m. 3:10, p.m. 7:00 p.m., and 10:15 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

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Arrive Cleveland..6:00 A.M | Arrive Detroit..6:00 A. M.

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THE STEAM IS MADE TO DO DOUBLE DUTY.

Its operation is sustained by steam pressure, brought directly upon the liquid (a cushion of air only intervening) as the forcing elements, while its subsequent condensation furnishes the lifting power.

IT WILL SAVE OVER 50 PER CENT. IN FUEL.

It never gets rusty or deranged, requires no oiling or packing, and requiring no special care, will, on a constant suction, **work day and night without attendance—** in fact, as long as steam and water are supplied.

It will raise, in combination with water, from 25 to 50 per cent. of mud, sand, gravel, pulp, etc.

From the peculiar simplicity of construction and operation, its compact form, wonderful efficiency and adaptability, great economy and durability, the NEW PULSOMETER has great advantage over all other systems of water elevation.

Every part that sustains any wear is now so constructed that it can be easily removed when worn, and replaced with but trifling cost, and when thus replaced will be as good as new.

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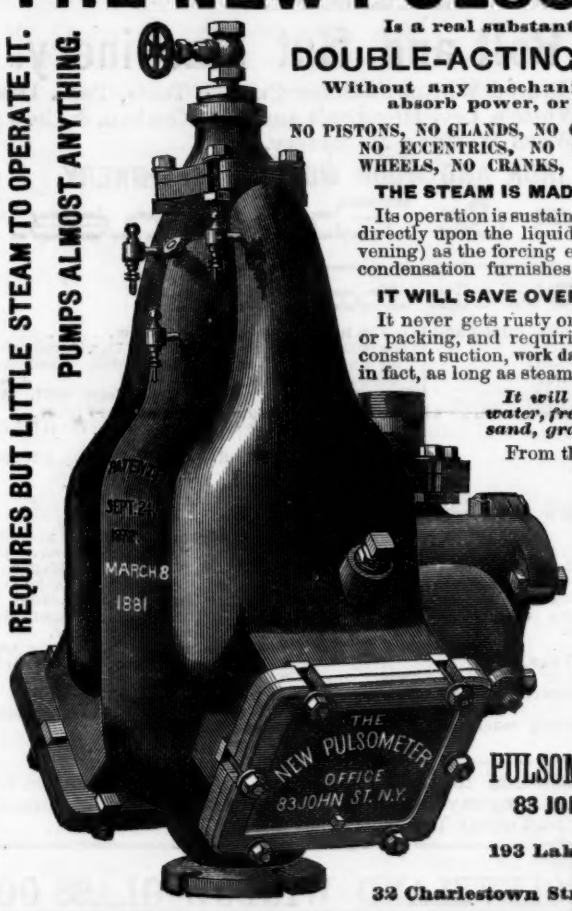

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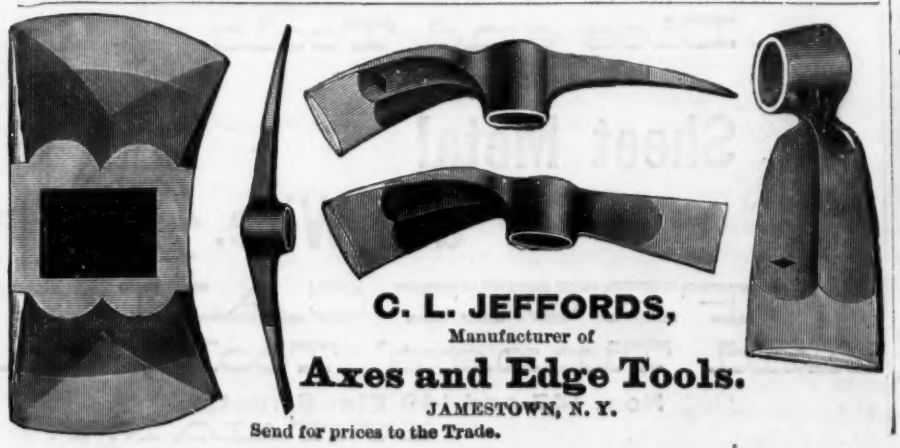

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JAMESTOWN, N. Y.
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CLEVELAND & PITTSBURGH RAILROAD.

Condensed Time Table of Passenger Trains, corrected to June 4, 1882.

MAIN LINE—GOING WEST.

	Day Expr'ss.	Mail Expr'ss.	Fast Line.	Accom.
Leave				
Pittsburgh..	8 00 a m.	1 20 pm	11 50 pm	4 05 pm
Allegheny...	8 12	1 30	12 00 am	4 15
Arrive				
Rochester...	8 53	2 20	12 50	5 00
Beaver.....	8 59	2 26	12 55	5 06
E. Liverpool.	9 37	2 59	1 37	5 46
Wellsville..	9 48	3 10	1 50	5 58 am
Salineville..	10 27	3 49	2 33	Arrive.
Bayard.....	11 05	4 22	3 21	.....
Alliance.....	11 35	4 50	3 55 am	.....
Leave				
Alliance	11 40	4 55	4 05	7 40 am
Arrive				
Ravenna	12 18	5 29	4 47	8 20
Hudson	12 48 p.m.	5 53	5 15	8 50
Cleveland...	1 45 p.m.	6 55 pm	6 30 am	10 15 am

Accommodation train leaves Ravenna at 6.50 a. m., arrives Hudson 7.20 a.m., Cleveland 8.35 a.m.

☞ Fast Line and Western Express run Thro' Sleeping Car, Pittsburgh to Cleveland.

NOTE.—Fast Line leaves Pittsburgh Sunday nights, but not on Saturday nights.

MAIN LINE—GOING EAST.

	Pittsb'g Expr'ss.	Fast Line.	Day Expr'ss.	Accom.
Leave				
Cleveland...	8 50 am	2 30 pm	11 40 pm	3 45 pm
Arrive				
Hudson.....	10 00	3 28	12 50 am	4 50
Ravenna	10 40	3 53	1 18	5 24
Alliance.....	11 25	4 25	2 05	6 05 pm
Bayard.....	12 02 pm	4 47	2 49	.....
Salineville..	12 44	5 22	3 40	Leave.
Wellsville...	1 20	5 50	4 35	8 05 am
E. Liverpool.	1 49	6 15	4 57	8 15
Beaver.....	2 26	6 47	5 47	8 59
Rochester...	2 35	6 52	5 52	9 05
Allegheny..	3 20	7 35	6 45 am	10 20
Pittsburgh..	3 30	7 45	6 55	10 30 am
Harrisburg..	.....	4 15 am	4 00 pm	.....
Baltimore....	.....	7 45	7 20	.....
Washington..	.....	9 15	8 47	.....
Philadelphia	.....	7 50	7 35	.....
New York....	.....	11 15	10 35	.....
Boston,.....	.....	8 00 pm	.....	.....

Accommodation train leaves Cleveland Union Depot at 5.30 p.m., arrives Hudson 6.48 p.m., Ravenna 7.15 p.m.

All trains connect at Yellow Creek for Wheeling and Bellaire.

☞ Fast Line runs Through Sleeper to New York. Day Express runs Through Sleeper to Pittsburgh.

All trains daily except Sunday.

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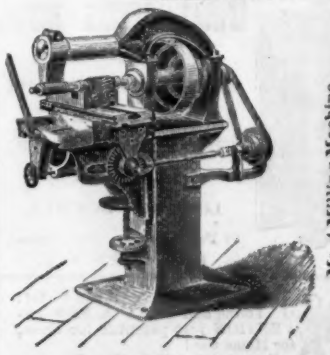

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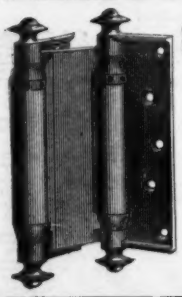

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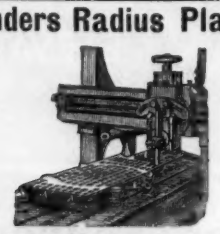

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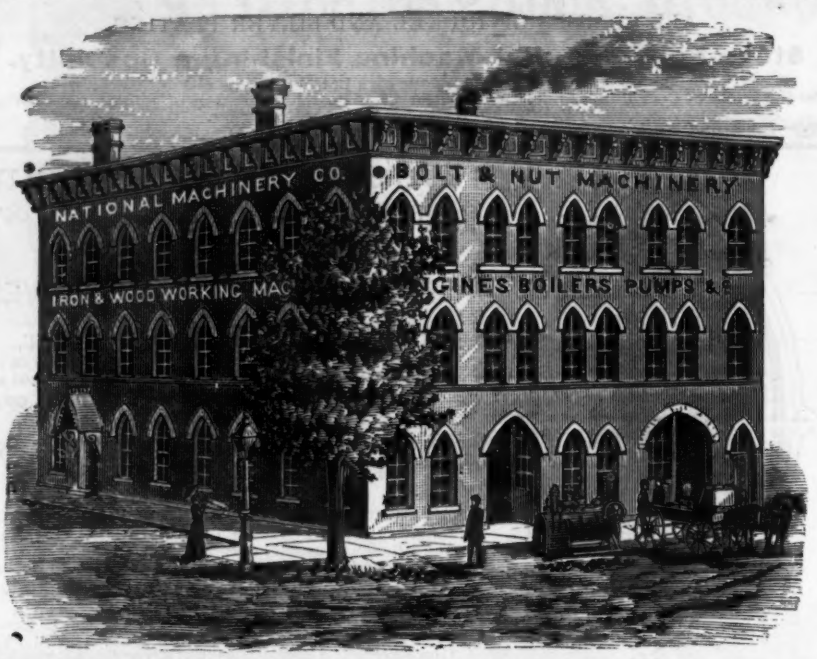

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One second hand wood frame 2-spindle Shaper, $35
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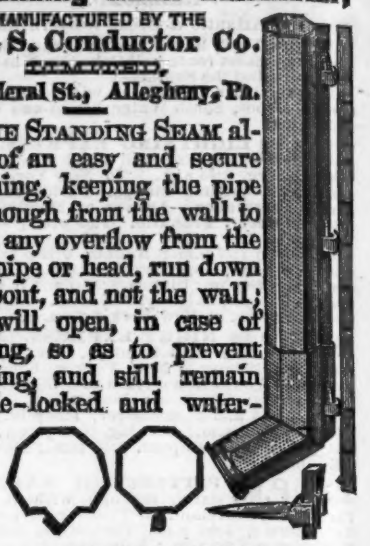

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